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WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

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A Pioneer Metallurgical Plant

A Description of One of the Oldest Alloy Producing Plants in the United States by One Who Has Been Associated with it Since 1887

Writen for The Metal Industry by F. J. DAVIS, Manager, Lockport Plant, The Electric Smelting and Aluminum Company

One of the historical plants of the country is that of The Electric Smelting and Aluminum Company at Lockport, N. Y. It is located in a picturesque valley on a small stream, twelve miles from Lake Ontario. The plant was built in 1886 by The Cowles Electric Smelting & Aluminum Company for the production of aluminum and various other metals and alloys in the electric furnace.

FIG. 1. AN ELECTRIC FURNACE USED IN 1885

The Cowles Company was incorporated March 18, 1885, and started in a small way at Cleveland, Ohio, the president of the Company being Edwin Cowles, founder in 1856 of the Cleveland Leader and in 1868 the Cleveland Evening News, which in 1883 absorbed the older Cleveland Herald. He was editor of these papers until his death in 1890. Eugene H. and Alfred H. Cowles, sons of Edwin Cowles, developed the great possibilities of the electric furnace, particularly in the production of aluminum and the alloys of aluminum, silicon, manganese, etc. They were awarded the Elliott Cresson and John Scott Legacy medals at Franklin Institute in 1886 and the Paris Exposition Gold Medal in 1889 for their inventions.

When the Lockport plant was completed in 1886 the Company started producing aluminum bronze, ferro-aluminum and silicon copper. These alloys were mainly made in the horizontal type of electric furnace. They were built up of fire brick, the interior dimensions being approximately 5 ft. long, 4 ft. deep and 16 in. wide. The electrodes first used were formed by bunching a number of carbon rods 1" in diameter and 48" long. These were the largest carbon rods that could be secured at that time. A holder or connecter of copper was cast around the ends and between the carbon rods. A little later rods 2¼" in diameter were employed in a like manner. These electrodes entered either end of the furnace on an angle of about 12 degrees with the horizontal and were adjustable. To protect the inside walls of the furnace, finely ground charcoal treated with a wash of lime, to render it a non-conductor, was used. When making aluminum bronze the furnace was charged with copper in granulated form and corundum or alumina with coarse pieces of carbon or charcoal mixed through the charge. About two hours were required to complete the reduction. The furnace was then allowed to cool and the metal produced, which was in the form of an irregular shaped pig about 3 ft. long weighing approximately 150 lbs., was taken out. This pig was not of uniform composition, varying from 10 to 30 percent of aluminum in different parts of the pig. Eight of these furnaces were in operation, but usually not more than two at a time. While these were in operation the others were charged and the current switched on to them as needed. On account of the lack of uniformity in the composition of the metal produced, it was necessary to remelt either in crucible or a reverberatory furnace and

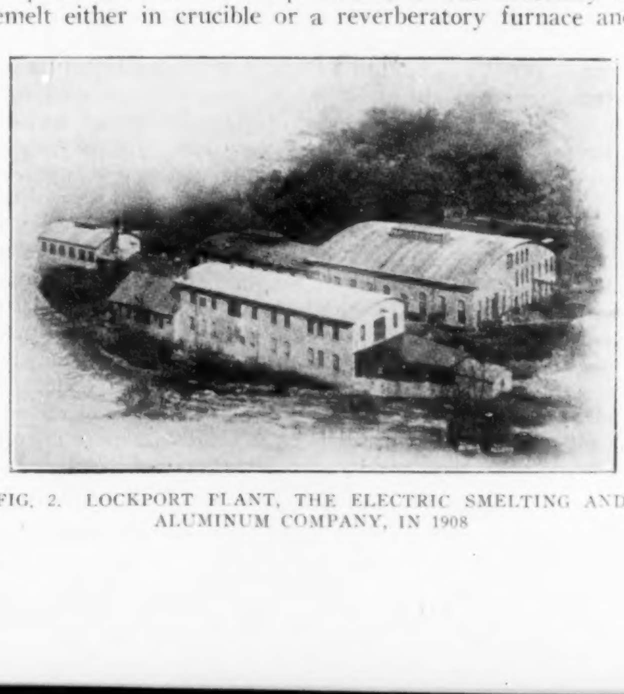


FIG. 2. LOCKPORT PLANT, THE ELECTRIC SMELTING AND ALUMINUM COMPANY, IN 1908

pour into ingots. These ingots were analyzed and from this rich alloy the standard grades of 5%, 10% and 11% aluminum bronze were made by remelting with the addition of more copper. In making silicon copper, about the same procedure was followed, with the exception that Medina sandstone which ran about 99% pure silica was used instead of corundum or alumina. This sandstone was taken from a quarry close to the plant. When making ferro aluminum, either iron turnings or old horseshoes, cut up into small pieces, or, when a particularly pure alloy was required, Swedish iron supplied the iron content. For the manganese copper alloy, manganese oxide was used as the source of manganese.

Another style of horizontal furnace used had but one movable electrode (the positive). The negative electrode was formed by building up a solid mass of carbon in one end of the furnace. The vertical type of furnace, in which the furnace itself lined with carbon formed the cathode and a carbon cylinder 8 inches diameter, about 5 ft. long suspended in the furnace formed the anode, was also extensively used. The cover and also the electrode holder were water-jacketed. All of these furnaces were built at the plant. Graphite electrodes were unknown in the early days and it was very difficult to obtain carbon electrodes of the proper dimensions as the carbon manufacturers had up to that time made carbons only as large as two inches in diameter.

In 1889 Alfred H. and Eugene H. Cowles obtained a patent for making manganese bronze. Until then manganese bronze had been made from ferro manganese

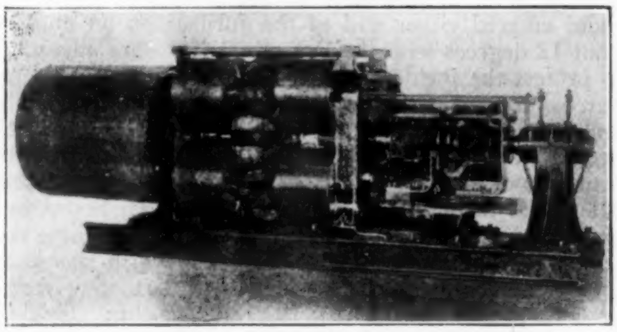


FIG. 3. DYNAMO USED FOR ELECTRIC SMELTING IN 1885

which necessarily introduced a considerable amount of iron in the alloy. The manganese bronze made at the plant here under the above patent contained no iron, the manganese being introduced in the form of cupro-manganese which was made in the electric furnace. The composition of the bronze was as follows: Manganese 3.75%, Zinc 42.00%, Aluminum 1.00%, Copper 53.25%. It had a tensile strength of about 80,000 pounds per square inch, with 8% to 10% elongation. Manganese bronze made by other manufacturers contained very little manganese, the iron content being considerably higher than the manganese.

The Brush Electric Company of Cleveland furnished the dynamos for supplying the current to the furnaces. These dynamos or generators were driven by horizontal water wheels. The dynamos weighed about 20,000 pounds each and delivered 3,000 amperes at 70 volts to the furnaces. Later, two of these dynamos were hooked up together, thus delivering 6,000 amperes. At that time they were the largest generators in the world. In 1885 a 35 H.P. generator was designed for the Cowles Company which with 50 volts produced the largest ampere current that had ever been produced. This was followed in that year by a 180 H.P. generator, then the largest in the world.

Shortly after the plant started operating, an order was received from London, England, for 100 tons of a special grade of aluminum bronze, the specifications for which called for a tensile strength of 100,000 pounds per square inch with an elongation of 5% in one inch. The metal for this order was made successfully and standardized in crucibles holding 500 pounds each, every ingot (15 lbs.) being stamped with the tensile strength and elongation. The writer recalls also having received an order from the Italian Government for a quantity of aluminum bronze rods which were to be used for gun barrels. The metal for these rods was cast in billets and forged by hand to the required dimensions. The Cowles Company introduced, under a patent to Eugene H. Cowles, the idea of adding aluminum, in form of ferro-aluminum, to steel during casting to prevent blow-holes. This was at the Cleveland Rolling Mills and the Otis Iron Works. Later, a great many tons of ferro-aluminum were made for the United States Mitis Company of Philadelphia, to be used in making mitis and steel castings.

We made a number of shells for torpedoes for the Whitehead Torpedo Companying at Fiume, Austria. The shells were cast in sand molds. Success in producing a torpedo shell stronger than steel previously used was attained by casting the metal inside of a rotating cylinder, lined with agglutinated dry sand, the metal being thrown against the inner wall of sand by centrifugal force and all impurities or dross remained on the inner surface of the cylinder produced. The walls of the shells when cast were about ¾" thick. They were bored inside and turned outside, the finished thickness of metal being about one-fourth inch. A propeller wheel was also made of alumium brass for the U. S. Gunboat "Petrel." Among the other interesting alloys made was one called Silver Bronze, invented and patented by E. H. Cowles. Its composition was 18% manganese, 1% aluminum, 13.50% Zn. and 67.50% Copper. The alloy was drawn into wire for electrical purposes, it having four times the electrical resistance of German silver. Other alloys were found containing copper, aluminum, manganese and zinc having a constant electrical resistance with variations in temperature which were patented by Alfred H. Cowles.

In those days bicycles were in their prime and we cast a large number of sprocket wheels and other parts from different grades of aluminum bronze and aluminum brass.

Among the alloys made at the plant in the early days a considerable quantity of silicon copper was turned out and the Cowles Company was the first to get it into commercial use. The alloy as marketed contained 90% copper and 10% silicon and was used and is still being used to a considerable extent for the production of solid, pure copper castings, 1 pound of the 10% alloy being used in 100 pounds of copper, thus introducing one-tenth of 1% of silicon in the copper. The silicon deoxidizes the copper and by its use a solid casting can be made. When just the right amount of silicon is used none of it remains in the copper, the result being a copper casting of high electrical conductivity. Silicon copper is extensively used at the present time as a deoxidizer for copper and copper alloys.

In 1887 the Cowles Brothers became interested in the subject of aluminum bronze for heavy guns and on October 27th of that year Alfred H. Cowles wrote a paper entitled Aluminum Bronze For Heavy Guns which was discussed at a meeting of the U. S. Naval Institute.

Carborundum (carbide of silicon) was also produced by the Cowles Brothers in the electric furnace under their patents and, after many years of litigation with the Carborundum Company of Niagara Falls, a court ruling in favor of The Electric Smelting & Aluminum Company was handed down, awarding them all net profits made by the

Carborundum Company from 1891 to the expiration of the Cowles patented involved, June 9th, 1902.

Calcium carbide is another electric furnace product. It was first made by the Cowles Brothers in a finely divided condition. Its process of making was patented by the Cowles Brothers and later it was made in considerable quantities at the Lockport plant for the Washington Carbide Company, a licensee of the Electro Gas Company. The latter Company had formerly become a licensee under the Willson and also the Cowles patents and was later reorganized into the Union Carbide Company, now the Union Carbide & Carbon Company.

In 1890 the production of pure aluminum was started at Lockport on a commercial scale and shortly thereafter the price of the metal was reduced by The Cowles Company from $1.25 to 50c per lb. About two years later a suit was brought by the Pittsburgh Reduction Company, later the Aluminum Company of America, against the Lockport Company for infringement of a patent issued to Charles M. Hall, and the interlocutory court decision placed the Lockport Company under an injunction restraining them from manufacturing aluminum. In 1902 this case was reopened on its merits which left it as though a suit had never been brought and in 1903 The Aluminum Company of America were found infringers of a patent, the application for which had been purchased by the Cowles Brothers in 1885 from one Charles S. Bradley and which was issued in February, 1892. Following this, a settlement was arrived at between the two companies wherein the Aluminum Company of America became a licensee under the Cowles and Bradley patents for the manufacture of aluminum.

In 1895 the Company was reorganized and has been doing business under the name of The Electric Smelting & Aluminum Company since that date.

In 1908 the Company started manufacturing a varied line of patented detergents, for use in laundries, textile mills, dairies and for other work where a controlled alkali is required, and metal cleaning compounds for removing grease, oil, etc., before plating and after machine operations, and these have now grown to be the Company's principal products.

The President of the Company is Alfred H. Cowles, who resides at Sewaren, New Jersey, and the Treasurer and General Manager is Edward S. Bassett of Cleveland. The general offices of the Company are at Cleveland, Ohio.

Pickle for Bronze Wire

Q.—We need a pickling solution for bronze and copper wire about .0113 in. in diameter, the wire to pass through the pickle at the rate of 8 to 15 ft. per minute. There might be a little oil or other foreign matter on the wire which would need to be removed also.

A.—A pickling process, as understood in the non-ferrous industry, consists of removing oxides born of annealing the metal, by immersion in a bath of sulphuric acid and water (6 to 8% free acid). This rapidly frees the metal so treated from all oxides, and after passing through a clear water bath and proper drying, it is ready for further reducing operations—drawing or rolling, as the case may be, or to use as soft metal.

As the metal to be pickled comes directly from the annealing furnace to the pickling operation there can be no accumulation of oil or foreign matter, such as is mentioned in the last paragraph of your letter. Without any further knowledge we can only assume that the oil on the wire is the result of some fabricating process the wire passes through. If this is the case, there is no "pickling" solution that will act on it without first passing it through some alkaline solution to remove the grease; and if the metal is discolored by tarnishing, which is a microscopic film of oxide, this can then be removed by passing through the pickling solution at the speeds you mention.

There are cleaner manufacturers advertising in the METAL INDUSTRY who specialize in preparations for removing grease, etc., from metal. It is possible that a cleaning is all that your wire needs.—W. J. PETTIS.

Solder or Braze for Aluminum

Q.—Can you tell me if there is any "general" hard solder or braze on the market which can be used to join aluminum to other metals? If there is, what is its approximate cost per ounce? In your opinion, can aluminum be joined to the other metals?

A.—There is no general hard solder or braze on the market that will make a satisfactory connection between aluminum and bronze or steel. It is possible to solder alloys of aluminum to other metals, as well as to steel and iron, but one is never confident of the result.

Owing to the difference in the melting temperature of aluminum, brass and steel it is impossible to fuse them together. Pure aluminum is in flames long before the steel is hot enough to amalgamate with it. With bronze it is practically the same. There is a possibility of heavy aluminum being spot welded to either of the other two metals, provided the two high tempered articles were very thin.—W. L. ABATE.

Soldering on Cadmium Plate

Q.—Please advise us as to the best flux on the market for soldering iron wire to cadmium plated silicon iron. We have a great deal of trouble getting a flux to adhere satisfactorily to the cadmium plate.

A. (1)—We do not know of any special soldering flux adapted to soldering iron to iron that has been cadmium plated. You might try the following mixture: Melt equal parts, by weight, of beef tallow and powdered yellow rosin in an iron pot; dissolve 4 ozs. white sal-ammoniac in as little hot water as possible, so that the water is saturated, then add slowly to a 1 lb. mixture of the tallow and rosin. You might also try a mixture as follows: Lactic acid (80%) 2 ozs.; glycerin 2 ozs; water 8 to 16 ozs.

The point of importance in soldering cadmium plated steel surfaces is to use a flux that will prevent oxidation. It is also necessary to use a so-termed, "fat solder": 2 parts tin, 1 part lead.—C. H. PROCTOR.

A. (2)—Many times in making solder stick to cast iron, the difficulty is not in the flux used but in the casting being unclean, or too large to heat readily. The surface should be heated and tinned to make the solder stick. Use undiluted muriatic of zinc as a flux. You can try this method on cadmium plate:—Take a small quantity of mercury and amalgamate it with tin filings until it forms a plastic amalgam. Clean the surfaces to be soldered. Take a cloth moistened with muriatic acid and rub a little of the amalgam on it. Rub this amalgam thoroughly into the metal at the joint, then solder in the usual way.—P. W. BLAIR.

Nickel on Zinc Alloys

In an article entitled "Nickel on Zinc Alloys," on page 9 of our January issue, there appeared the direction: "Strike at a C. D. of 50 amperes per sq. ft. for 1 minute, then transfer to regular nickel bath." This amperage should have been 15.—Ed.

The Architect, the Artisan and Bronze

Some Important Factors in Making Up Building Bronzes*

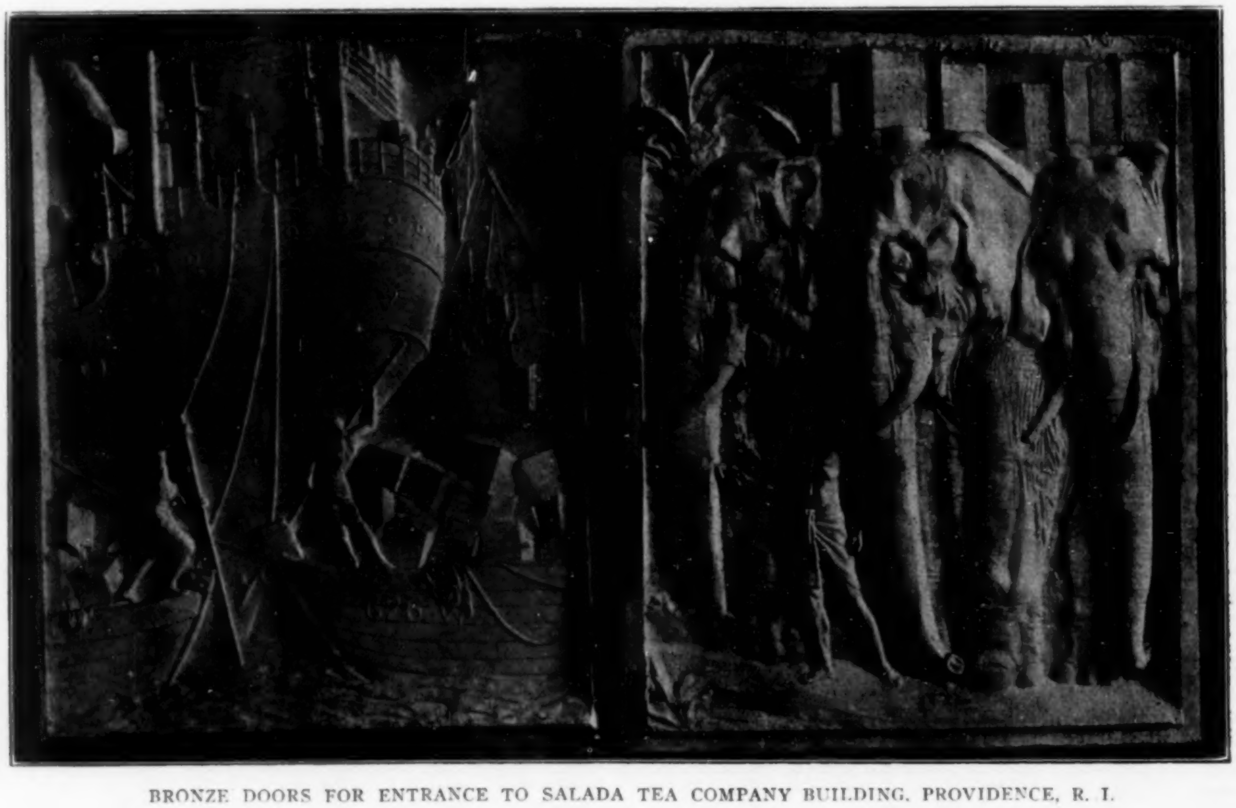
By GERALD K. GEERLINGS

An architect may design beautiful bronze doors and the bronze contractor cast them perfectly—yet within five years they may not be a credit to either because of inadequate or improper care on the part of the client. It is an old problem, of course, to try to impress on clients that theirs is a responsibility which neither architect nor contractor can assume after the completion of the building. If bronze is to serve its purpose of beautifying a building it must be cared for continuously in an intelligent manner. No client thinks it an extravagance to place a regular contract for window cleaning, yet the same client will not consider placing a similar agreement for the weekly care of his exterior bronze unless duly impressed of the necessity by the architect. One of the outstanding banks of New York City has a beautiful bronze window with ornamental frame above the main entrance; the glass is religiously cleaned regularly, yet the bronze has not been touched since it was erected. All the conscientious efforts of the architects to achieve a thing of beauty in designing the ornament and the excellence of the workmanship are almost valueless as the bronze continues to become blacker and sootier. Soon it will appear to be cast iron, and may not even seem to have any ornament at all after the next hard coal strike. It is one thing to point to the famous Ghiberti doors on the Florence Bapistry and remark that they have not been cleaned once a week since they were up, but we have not any Ghiberti's who cast almost free-standing bronze ornament which, therefore, cannot be smothered by dirt. It is also well to recall that Florence is practically free from soot. Flat *rinceau* ornament twenty feet above the pavement is not worth doing in bronze if it is not to be properly cared for.

When the architect is discussing materials with his client at the outset, he should not make the assertion that bronze requires no care such as wrought iron and other metals do. It is only fair to the client that he know bronze should be cleaned regularly. Exterior work should be wiped off about once a week with a cloth moistened with boiled linseed oil, or wax, to clean it as well as to prevent excessive oxidation. Where bronze has long been left uncared for and it is desired to bring it back to a rich brown color, some bronze contractor should be given the job of applying some "sharp water" (dilute acid) and reconditioning the finish. Unintelligent cleaning of bronze usually results in shiny high-lights on the upper parts of the ornament and a sordid range of green and black polish-debris along all edges and in all depressions.

A not uncommon modern practice is to have the bronze contractor apply lacquer to all interior work in the hope that it will continue to remain in the same state as when it leaves the foundry's finishing department. It is questionable whether this is good practice, because sooner or later the lacquer will wear off certain areas. What follows is that the bare spots oxidize because of exposure to the air and very soon they begin to appear quite different in color from the areas still lacquered. Almost everyone can recollect seeing bronze doors in lamentable condition, because of the coating wearing off and ugly, irregular splotches disfiguring the finish. The expense to remove

* Excerpt from an article published in Pencil Points, and later in Graphite.



BRONZE DOORS FOR ENTRANCE TO SALADA TEA COMPANY BUILDING, PROVIDENCE, R. I.

all the lacquer in the attempt to give the surface a uniform appearance probably costs more than proper *regular* care.

One of the greatest problems of the bronze contractor is to be able to make an intelligent estimate from the architect's drawings. If the architect has details at ¼ of an inch scale, with an occasional full-size detail, and a specification which is absolutely definite, the estimator can give an accurate price which will be fair to his company as well as to the client. It will be a square competition between the bidders, and gives fair assurance that there will be no extras, hard feelings, pitched battles, or less to the foundry. But where details are left at ¼ inch scale, one of two things is likely to happen: either the contractor realizes that he may be compelled to furnish more elaborate work than seems to be indicated and therefore adds a generous percentage for the unknown details existing only in the architect's mind—which is unfair to the client—or he bids on what seems to be shown, only to find that the architect in doing full-size details has elaborated greatly and refuses to grant an extra—which is unfair to the contractor who was no mind-reader.

When the architect is discussing time requirements for the various materials he may have difficulty in approximating the period necessary to allow for the completion of the bronze work. Even the bronze contractor may be unable to determine that exactly because of not knowing how long certain work not under his control will require. Certain kinds of bronze might be furnished in a month, but it would be exceptional cast bronze which could be delivered on the job so soon after signing the contract. Six to eight weeks would be a better minimum to remember, while a complicated problem such as a richly ornamented counter-screen would be more apt to take from three to four months. Following is a list of the operations and steps figuring in the time element, in the order they occur when the bronze contractor has been authorized to proceed after bids on a job have been opened:

(1) Details received from the architect's office, working drawings prepared and sent back for checking. (2 weeks under good circumstances: more likely 3 or 4.)
(2) Accurate measurements obtained from job or general contractor. (This can be done while the working drawings are being checked.)
(3) Models received from the sculptor or modeler and patterns begun. (3 or 4 additional weeks at least; total so far about 5 weeks.)
(4) Metal patterns to be made. (2 weeks; total about 7 weeks.)
(5) Mill material ordered when shop drawings were checked, but shipments may be slow and hold up work. (Assume material arrives on time.)
(6) Pouring molds. (2 weeks; total about 9 weeks.)
(7) Filing, fitting, and chasing. (2 weeks; total about 11 weeks.)
(8) Polishing, buffing or brushing; coloring. (1 week; total about 12 weeks.)
(9) Delivery, erection. (2 weeks; total about 14 weeks.)

The above list is only an approximation, of course, for a strike or labor dispute in Timbuctoo may tie a bronze contractor's hands. He may have extraordinary good luck on the other hand and sail along in better time. The list, however, gives the architect some idea of what conditions the bronze contractor must meet, and he can understand that unless his scale and full-size drawings are forthcoming at once when contracts are let that nothing can be started. Also, shop drawings unless promptly checked will hold up the entire parade. Any help the architect can give the modeler by criticizing models when they are ready, instead of procrastinating, will expedite the work and get it finished with much better workmanship than if he delays. Too often he puts the contractor days behind schedule and then attempts to "speed things up" by jumping on the poor contractor at the time when the job would have been complete had the architect shown the speed he expects of the foundry.

It is human nature to suspect oneself of having the toughest row to hoe, and the architect usually decides without ever going near a bronze foundry that no contractor has as many worries or as meager financial return as he. But as stated previously, bronze men seem a good-natured sort and allow architects to believe themselves martyrs without raising a peep in protest. However, it is probably infinitely more difficult to run a foundry than a drafting room. There are many more complicated circumstances certainly. Draftsmen are not as numerous in an office as workmen in a foundry, do not have unions, and are brought up on the "charrette" idea. If a draftsman quits there are usually a half dozen to take his place. An order for tracing paper and thumbtacks can be filled within half an hour, but it takes months to get bronze from a mill. A drawing can always be lettered "Continue ornament," or "Details to be furnished to contractor later," or "Contractor to work out this condition on job." But the contractor must cast all of his ornament, must deliver all details when they are called for, and must work out all the hard corners which the architect's draftsmen could not or did not care to delve into.

On the other hand there is something to be said on the part of the architect, who conscientiously does all that can be expected toward expediting details, approving models promptly, and above all is anxious that his client be given the service that he is paying for. Some foundries are wont to give excellent service to the large offices which keep them supplied with work, but consider the small architect as legitimate prey on which to make up for their losses on other jobs. The shop foreman knows when castings should be re-done as well as the architect, yet it happens that his orders sometimes are that "Anything is good enough on this job. Shoot it through." If the foundry is being paid 100 cents on the dollar for first class bronze there is no reason why the architect should not demand 100 per cent workmanship. Too often the architect never sees the bronze work until it is being erected on the job and then, although the flaws are frightful, he cannot afford to reject it because of an "opening date" when the work must be completed. It might not have happened had he sent a representative to the foundry after the castings were made, at a time when there still was an opportunity for recasting them. Some offices are so slightly acquainted with what good bronze work should be that they accept disreputable work as a matter of course. Ignorance of that sort cannot be condoned with such plentiful old and new work on record which eloquently represents what bronze should achieve. Shoddy work does the bronze trade as much harm as it does to the architectural profession.

Battery Plates

Q.—Can you advise us the process of melting down battery plates into pig lead, or refer us to any one who can give this information?

A.—The process used for the smelting of battery plates into pig lead is the blast furnace or a reducing furnace similar to an open hearth furnace for smelting steel. It is necessary to reduce the oxide back to metal. This requires high heat and reducing fluxes. One of the fluxes used is iron scale mixed with soda ash, fluorspar, coal dust, and lime. When smelted in the reverberatory furnace or open hearth furnace it is best to have a man of experience in this line of work.—W. J. Reardon.

Electric Smelting Advancement

Recent Developments in the Induction Furnace and the Progress It Has Brought About in the Melting of Metals—Part 2*

Written for The Metal Industry by G. H. CLAMER, President, The Ajax Metal Company

THE AJAX-WYATT INDUCTION FURNACE

Then came the Wyatt invention describing the use of combined pinch effect, motor effect and thermal effect for circulating metal in the resistor and bath of an induction electric furnace. This was accomplished by Wyatt by the simple means of so forming the resistor loop that it made a return bend at a point removed from the bath.

The Ajax-Wyatt furnace has revolutionized the brass melting practice in the wrought brass industry. Over 90 per cent of the melting equipment previously used in this country has now been replaced by this type of furnace. A similar revolution in melting practice is proceeding in Europe and other foreign countries. The Ajax-Wyatt furnace is now also being adopted in the foundry industry. In foundry service such furnaces usually operate on a nine-hour schedule. Because of the importance and record established by this particular furnace, it will not be amiss to again give in some detail in this article a somewhat minute description of the furnace and its operation.

Plate 3 illustrates two views of the furnace jacket used in the Ajax-Wyatt furnace, with dotted lines thereon

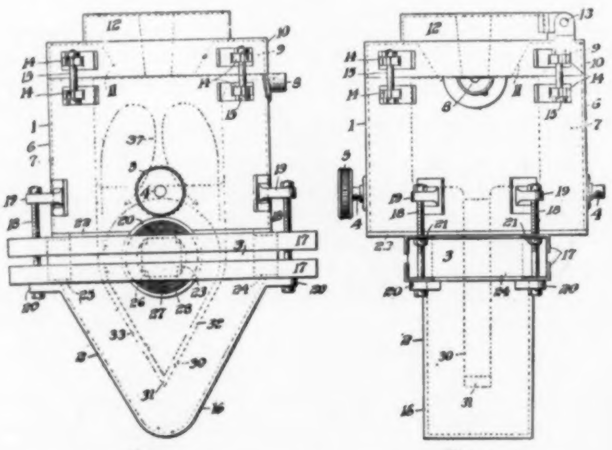


FIG. 1. FIG. 2.

PLATE 3. JACKET USED IN AJAX-WYATT FURNACE

to indicate the secondary circuit and the direction of the circulation.

In Figs. 1 and 2 of Plate 3 is shown one form of the Ajax-Wyatt electric furnace, having in general a body (1) and channel portion (2) connected therewith by a transformer (3). These with the closure for the body are adapted to be rotated about trunnions (4) in any suitable bearings by means of worm wheel (5). The means for securing support and rotation are so well known that I consider their illustration to be unnecessary. In this particular form, the furnace body, adapted to receive a pool of molten metal and melt the pieces of metal down into it, is made up of an outer jacket (6) lined at (7) and carrying a pouring spout (8). The upper portion of the body is partly closed by an annular tile (9) held in a shell (10) and having a conical opening in the annulus in which fits a plug (11) carried by a cover (12) and hinged at (13). The shell (10) is secured to the jacket (6) by means of ears (14) and bolts (15). In this construction it is preferred not to connect the casing (16) within which the lower part of the channel is formed directly with the body of the furnace, but to interpose the transformer between and form part of the channel actually within the transformer as distinguished from having the channel member merely pass through a gap in the transformer. In this way, the shell type of the transformer shown is built into the unit and forms part of the mechanical protection and frame of the complete furnace, reducing the metal parts, avoiding interruption of the magnetic circuit of the transformer, in order that it may be put in place and reducing heat losses. The transformer is conveniently connected to the other parts by the use of angle irons (17) at the top and bottom. Bolts (18) pass through these and through ears (19) upon the jacket and flanges (20) of the casing clamping the body, transformer and casing (16) firmly together. The bolts are secured by nuts (21) and corresponding nuts separately engage the under sides of the upper angle irons. A pair of brass spacing plates is shown at (22).

The transformer shown is of a single-phase shell type. Its laminated magnetic circuit has a central leg (23) and end legs (24) and (25). To accommodate a close circular winding, the edges of the central leg are cut, as shown, and the winding is put on in the form of a series of layers of parallel circular bands forming a circular primary winding. In the structure used, the primary winding (27) is formed from a flat strip of conductor wrapped with asbestos insulating tape and applied in rings interrupted at the points of cross connection with adjoining rings and also cross connected from one layer to the next at the ends of the rings adjoining layers. The casing (16) is a casting designed to engage the angle irons on opposite edges of the lower part of the transformer and to engage the edge of the primary winding. In lining the furnace frame thus formed, a two-part pattern is inserted having the shape of the channel and pool and having a division line between the parts at some point as 28, so that the lower part of the cementitious lining used can be placed and rammed before the upper part of the pattern can be inserted and the lower part of the pattern is put in place. Plastic material is then rammed about the form inside and out, completing the lining within the casing, transformer, and body of the furnace and filling the entire space about the primary winding except the portion occupied by the pattern; the pattern (made of wood) is so treated and designed that it does not by expansion crack the lining. The refractory lining is subsequently dried out gradually and finally burned out with an oil or gas torch. The most approved

*Part 1 was published in our issue of January, 1928.

method at the present time, however, is to use pre-formed, pre-fired blocks containing the secondary channel. These are referred to later.

The channel (30) is flattened in cross section, preferably of rectangular or approximately rectangular shape and with the longer dimension of rectangle parallel with the axis of the transformer winding. The channel length is formed with an acute angle at the turn at (31) outside of the furnace and in the turn at the pool acute angles are avoided, the contour being rounded between the connections with the pool or at least obtusely angled where the connections are made with the furnace. In the form of Figs. 1 and 2, plate No. 3, the channel meets the pool in a generally vertical direction, and on opposite sides at the outer edges of the pool, thus securing a maximum effect for the stirring action produced within the channel.

When electric currents traverse fluid conductors (such as molten fluid in the channel parts 32 and 33), and flow in opposite directions, electro-dynamic forces are set up in the conductors in directions perpendicular to the lengths of the conductors, tending to separate the conductors. The forces vary directly as the product of the current flowing in the two conductors (as the square of the current where the same current flows in each) and inversely as the distance between the parts of the fluid affected. Where these conductors are not parallel, the electro-dynamic forces vary in magnitude from one point to another along the lengths of the conductors, because of the differing distances separating them at these points and cause correspondingly varied hydro-dynamic forces tending to produce motion of the fluid parallel to the lengths of the conductors. The application of motor effect causes motion of the fluid and hence circulation, if the fluid be free to flow. The motor effect, causing this circulation, may be intensified by bringing the conductors together into an angle and becomes most effective where the angle is acute, increasing within reasonable limits with the acuteness of the angle. Though Joule effect and some pinch effect is also present, the hydrodynamic pressure due to electro-dynamic motor effect is the dominant force in the Ajax-Wyatt furnace, which not only depends generally upon this pressure for circulation of the heated metal, but gets great advantage from the intensity of the pressure in the angle where overheating would otherwise take place.

Thus far the Ajax-Wyatt furnace has only been developed for operation on single phase. It is, however, perfectly feasible to construct furnaces operating upon the Ajax-Wyatt principle in two and three phase form. The largest single units thus far built in this country have a power input of 90 kilowatts. Furnaces are in use abroad with a power input of 120 kilowatts per single phase.

The above figures refer to brass melting furnaces. In melting of iron or steel, or other high resistivity metals, it is quite possible to increase the power to 150 or perhaps 250 kilowatts. The practical limitations to the size of the furnace are the following:

(1) Increasing refractory difficulties.

(2) Increasing magnetic leakage, depending on the increase in size of the secondary loop, with consequent reduction in power factor.

(3) Adding heat at a rate more rapidly than it is possible to carry it out of the resistors. If heat accumulates in the resistors volatilization of metal and softening of the defractory linings will occur.

It is not yet definitely determined if the figures above mentioned are the absolute practical upper limitations, because with further experience it may be found that these in reality can be greatly exceeded.

The following figures are given as typical performances of Ajax-Wyatt furnaces:

ROLLING MILL OPERATION (BATTERY PRACTICE) 24 HOURS PER DAY

Yellow Brass—60 K.W. Furnace Rating

	Cost per Ton
Power—200 KWH @ 1⅓c.	$2.67
Lining—500 Tons Life	.30
Maintenance—(Electrical) (Replacements)	.18
Labor—@ 65c per hour	1.30
Metal Loss—¾%—15 lb. @ 11c.	1.65
Total	$6.10

Nickel Silver—75 K.W. Furnace Rating

	Cost per Ton
Power—300 KWH @ 1⅓c.	$4.00
Lining—250 tons Life	1.20
Maintenance—(Electrical) (Replacements)	.22
Labor—@ 65c per hour	1.56
Metal Loss—¾%—15 lb. @ 16c	2.40
Total	$9.38

FOUNDRY OPERATION (BATTERY PRACTICE) 9 HOURS PER DAY

Yellow Brass—60 K.W. Furnace Rating

	Cost per Ton
Power—275 KWH @ 2c	$5.50
Lining—500 Tons Life	.30
Maintenance—(Electrical) (Replacements)	.18
Labor—@ 65c per hour	1.30
Metal Loss—¾%—15 lb. @ 11c	1.65
Total	$8.93

Red Brass—75 K.W. Furnace Rating

	Cost per Ton
Power—325 KWH @ 2c	$6.50
Lining—250 Tons Life	1.20
Maintenance—(Electrical) (Replacements)	.25
Labor—@ 65c per hour	1.30
Metal Loss—½%—10 lb. @ 12½c	1.25
Total	$10.50

NOTE: The above costs are based on charges consisting of new metal or medium weight clean scrap.

The greatest problem connected with the development of the submerged channel type induction furnace has been that of refractories. From the electrical standpoint, the furnace, due to its absolute simplicity, was so designed in its very early form that it performed in accordance with calculations right from the start. The electrical efficiency almost approaches that of transformer practice. Namely, the electrical efficiency approximates 90 per cent. The power factor, depending upon the size of the furnace and the kind of metal melted, is between 70 and 85 per cent. By recent improvements and the use of static condensers, the power factor may be made to approach unity.

In the melting of yellow brass, it was fortunate that a refractory material of the clay base type was found from the start to be satisfactory. Yellow brass is poured at a lower temperature than red brass. If lead is not present to the extent of more than approximately 3 per cent in such mixtures, there is no attack upon a clay base refractory material. Another fortunate performance of such alloys is that they penetrate the refractory to a lesser degree than the higher copper alloys, and particularly the higher lead alloys. Yellow brass alloys will not flow through tiny cracks. In the submerged type of induction furnace it is of course fatal if the liquid metal

penetrates the refractory to the extent that it either short circuits the secondary loop or makes contact with the outer jacket, or reaches the primary coil of the transformer. The clay base refractory materials have a certain plasticity in the heated state, thereby making it possible for them to conform to expansive and distorting strains without cracking.

For melting alloys requiring higher melting and casting temperatures, particularly those containing lead, it was early found that the clay base refractories could not be used. Such refractories are fused and also attacked by

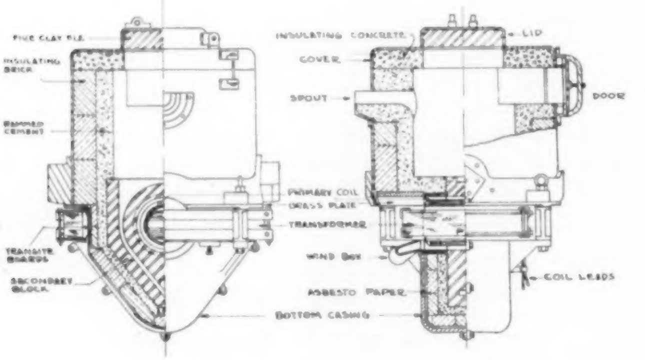


PLATE 4. SECTION VIEW OF BLOCK LINING

lead oxide. Much time and money has been spent in the search and development of a suitable refractory for metals other than yellow brass. It has not been until comparatively recently that really satisfactory refractory materials in the form of pre-formed and pre-fired blocks containing the resistor channel have been produced and are available for the latter purpose. Plate No. 4 is a sectional view showing complete lining and the use of the above block.

In the case of large installations, it has been possible to have available a trained man or a crew of men who are experienced in lining induction furnaces. This has made possible the practical use of a rammed-in lining. In the case of smaller installations, particularly where there are only one or two furnaces, the necessary skilled labor is seldom available, and it thus becomes a practical necessity to use a pre-formed and pre-fired secondary block. Such blocks are placed in the furnace with little more skill than is required to "set" a crucible. Such blocks are now available for melting the high copper alloys, nickel silver and copper base alloys with high lead content.

Five hundred and ninety-two Ajax-Wyatt furnaces are at present in use in the United States and abroad. These furnaces are melting approximately 6,000,000 lbs. of metal per day.

This article will be concluded in an early issue—Ed.

Silver Refining

Q.—How can I refine and recover sterling silver that is mixed with polishing dust or emery? Where can I obtain a good book on the subject?

A.—Since silver is comparatively cheap, being worth at present only about 58c. per ounce, it does not pay to refine it unless you have large quantities. That is, you will spend more in time and chemicals than the metal is worth. The professional refiners handle large amounts at a time, thereby reducing the labor expense per ounce to a very small sum.

But if you wish simply to get your finely divided metal back into a button or bar, free from the polishing dust and emery, the job is not so hard. Melt it up with a good quantity of flux, using a gold-melting furnace. In most cases the button of metal that you obtain will be too impure for any practical purpose, but will be in the right form for sale to a refiner.

There are several good fluxes on the market. Here is one you can easily mix up yourself: For each pound of polishings, use a pound of soda ash, a half-pound of borax glass, and five ounces of clean sand. (If your polishings are already mixed with sand, such as the sand from a sand blast, you will not need to add more sand.)

Many people use sand or clay crucibles for this work, but the soda ash eats into the crucible and weakens it. For that reason a graphite crucible is better. If you do use a sand crucible, add some powdered charcoal or some sugar, to reduce oxides.

When melting silver, never use ammonium chloride (sal ammoniac), or any other chloride in your flux.

If you pour the molten silver, wait till it is as cool as possible and still molten, and keep it covered with flux as long as you can. Molten silver, especially when pure, has a way of spitting when poured.—C. M. Hoke.

Fire Hose Couplings

Q.—We are considering the manufacture of fire hose couplings, and if you can give us any information as to how the operation is handled which rolls the swivel on the half of the coupling, we will greatly appreciate it.

From samples that we have seen, the half of the coupling is machined to fit into the swivel part, and then it is rolled or spread in some manner to expand into the swivel part so that the swivel part swings around and does not come off.

A.—In the manufacture of fire hose couplings the parts that receive the hose are counterbored on the inside and have raised projections to grip the hose. The ring which formerly used to be made of copper is now made of brass. The reason for the change is that the copper was not strong enough for the work when the high pressure system came into use. This expanded ring is forced into place by hydraulic pressure.

One of the machines used for expanding the ring into place is the Buckley Hydraulic Expander manufactured by the Larkins Manufacturing Company, Dayton, Ohio. This machine has an electric motor as a power unit and drives the water pump to the required pressure. The expander fits the brass ring nicely when placed in position in the coupling frame or casing with the hose and the motor being started the ring is quickly expanded into place.

As great strain is placed on the hose couplings when in use, strain due to pulling the hose during a fire, or in winding up the hose and in many other uses and abuses of the coupling, it is necessary that they be attached firmly and securely to the hose. With the proper expanding apparatus this is easily accomplished. The copper ring was discarded because it was found too soft and brass was substituted, the brass composition being of such nature, made for the job, that it will expand without breaking.—W. L. Abate.

Standards for Fabricated Metals

United States Government Proposed Master Specifications for Copper Nickel Alloy Rods, Bars, Shapes, Plates, Sheets, and Strips; Also for Brass Wire

The Federal Specifications Board in Washington, D. C., would be glad to receive any comments or suggestions as to changes which may be thought to be desirable in the following specifications. Such comments or criticisms will have to be received by this Board not later than March 9, 1928, if they are to receive attention of the technical committee considering this subject.

I. GENERAL SPECIFICATIONS

United States Government General Specifications for Metals, Federal Specifications Board specification No. 339, in effect on date of invitation for bids, shall form part of this specification.

II. GRADE

This specification covers one grade of copper nickel alloy in the form of rods, bars, shapes, plates, sheets and strips.

III. MATERIAL

1. The material shall be a copper nickel alloy containing approximately 65 per cent nickel and 28 per cent copper, and shall be manufactured from raw material of good quality. Scrap of known and approved composition may be used.
2. The material shall be uniform in quality, clean, sound, smooth, commercially straight or flat, and free from pipes, slivers, laps, cracks, twists, seams, scale, damaged ends or edges, buckles and other injurious defects.
3. The material shall be furnished in the hot rolled or forged condition, unless otherwise specified in the contract or purchase order.
4. Sheets and strips, when ordered for spinning or drawing, shall be of such quality that, after spinning or drawing, the material may be finished and will present a good smooth surface which will not be spotted or open grained.
5. When specified in the contract or purchase order, plates, sheets and strips shall be supplied with finished edges, as detailed hereinafter.

IV. GENERAL REQUIREMENTS

See detail requirements, Section V.

V. DETAIL REQUIREMENTS

1. The chemical properties shall be as follows:

TABLE 1—CHEMICAL PROPERTIES

Copper, Minimum Per Cent	Nickel, Minimum Per Cent	Iron, Maximum Per Cent	Aluminum, Maximum Per Cent	Manganese, Maximum Per Cent	Carbon, Maximum Per Cent	Silicon, Maximum Per Cent
23.0	60.0	3.5	0.5	3.5	0.3	0.5

2. The physical properties shall be as follows:

TABLE 2—PHYSICAL PROPERTIES

Diameter or Thickness (inches)	Tensile Strength, minimum (pounds per square inch)	Yield Point, minimum (pounds per square inch)	Elongation in 2 inches, per cent minimum
Rods and Bars:			
Rounds or squares			
¼ in. and under	75,000	30,000	30.0
Over ¼ to 1, incl.	80,000	40,000	30.0
Over 1 to 2, incl.	85,000	48,000	30.0
Over 2 to 3.5, incl.	80,000	35,000	35.0
Over 3.5	80,000	40,000	32.0
Hexagons or Rectangles			
All sizes	80,000	40,000	30.0
Shapes, plates, sheets, and strips:			
Under 0.25	*	*	*
0.25 and over	60,000	25,000	25.0

* No requirements.

3. Rods and bars, except forging stock, measured on their diameters or between parallel faces, shall not vary from the specified dimensions by more than the amount shown in Table 3.

TABLE 3—PERMISSIBLE VARIATIONS IN DIAMETER OR THICKNESS, RODS AND BARS, EXCEPT FORGING STOCK

Diameter or thickness, inches.	Permissible Variations Plus (inches)	Permissible Variations Minus (inches)
Rounds and rectangles:		
1 and less	0.016	0.016
Over 1 to 2, inclusive	.031	.016
Over 2 to 4, inclusive	.047	.031
Over 4	.125	.063
Hexagons and squares:		
Hot-rolled—		
1.2 and less	.016	.016
Over 1.2	.031	.031
Forged—		
1.5 and less	.031	.016
Over 1.5	.031	.031

4. Rods and bars for forging, measured on their diameters or between parallel faces, shall not vary from the specified dimensions by more than the amounts shown in Table 4.

TABLE 4—PERMISSIBLE VARIATIONS IN DIAMETER OR THICKNESS, RODS AND BARS FOR FORGING

Diameter or thickness, inches.	Permissible variation for all sections, (inches).
Up to 0.5	± 0.005
0.501 to 1	± 0.008
1.001 to 2.5	± 0.010
2.501 and over	± 0.015

5. Unless the contract or purchase order expressly states that rods and bars are intended for forging, the permissible variations specified in Table 3 shall apply.
6. For shapes, the permissible variation shall be as specified in the contract or purchase order.
7. Round rods, except forging stock, shall not be out of round more than one-half the permissible variation in diameter stated in Table 3.
8. Square, rectangular and hexagonal rods, bars, and shapes shall have practically exact angles, and shall have sharp corners unless otherwise specified.
9. Rods, bars and shapes of all sizes may be ordered to exact lengths, in which case a variation of plus ⅛ inch on length shall be permitted.
10. When rods and bars 1 inch or less in diameter or thickness are ordered in stock lengths, the pieces shipped shall be cut to the nominal or stock length as a maximum. The shortest acceptable lengths, and the maximum permissible percentage by weight of short lengths in any one shipment shall be as shown in Table 5.

TABLE 5—PERMISSIBLE VARIATIONS IN LENGTH OF RODS AND BARS

Nominal or stock length, feet.	Shortest acceptable lengths, feet.	Maximum permissible percentage by weight of short lengths.
20	12	80
18	10	80
16	10	80
14	8	80
12	8	40
10	6	40
8	6	40
6	4	40

11. Unless exact lengths are specified, rods and bars over 1 inch in diameter or thickness shall be furnished in stock lengths as follows (but in no case shall more than 80 per cent of lengths shorter than 20 feet be accepted):

Over 1 to 4 in., incl., diameter or thickness, 8 to 20 ft.

Over 4 inches, diameter or thickness, 6 to 20 feet.

12. The permissible variations in thickness for plates, sheets, and strips shall be as shown in Table 6.

TABLE 6—PERMISSIBLE VARIATIONS IN THICKNESS OF PLATES, SHEETS AND STRIPS

Thickness, inches	Widths, inches	Permissible variations
0.02 and less	All widths	+ .002 inch
Over 0.02 to 0.04 incl.	All widths	+ .003 inch
Over 0.04 to 0.065 incl.	All widths	+ .004 inch
Over 0.065 to 0.08 incl.	All widths	+ .005 inch
Over 0.08 to 0.1 incl.	All widths	+ .006 inch
Over 0.1 to 0.12 incl.	All widths	+ .007 inch
Over 0.12 to 0.25 incl.	All widths	+ .008 inch
Over 0.25	48 and less	+ 5 per cent
Over 0.25	Over 48 to 60, incl.	Plus 5 per cent minus 7 per cent
Over 0.25	Over 60	Plus 5 per cent minus 8 per cent

13. The permissible variations in width for plates, sheets, and strips shall be as shown in Table 7.

TABLE 7—PERMISSIBLE VARIATIONS IN WIDTH OF PLATES, SHEETS AND STRIPS

Width, inches	Permissible variations, inches Plus	Minus
Two and less	0.010	0
Over 2 to 5, inclusive	.025	0
Over 5 to 14, inclusive	.050	0
Over 14	.125	0

14. Plates, sheets, and strips of all sizes may be ordered to exact lengths, in which case a variation of plus ⅛ inch on length will be permitted.

15. When plates, sheets and strips up to 12 inches wide are ordered in stock lengths, the pieces shipped shall be cut to the nominal or stock length as a maximum. The shortest acceptable lengths, the maximum permissible percentage by weight of short lengths, and the required percentage by weight of stock lengths in any one shipment shall be as shown in Table 8.

TABLE 8—PERMISSIBLE VARIATIONS IN LENGTH OF PLATES, SHEETS AND STRIPS UP TO 12 INCHES WIDE

Nominal or stock length, feet	Required per cent by weight of stock lengths	Maximum permissible percentage by weight of short lengths 8 to 10 feet	6 to 8 feet	4 to 6 feet	2 to 4 feet	Under 2 feet
10	60	40	30	20	10	0
8	70	..	30	20	10	0
6	80	..	..	20	10	0

16. Sheets and strips in long lengths shall not exhibit sidewise bend or curvature in excess of 0.25 inch per foot

17. When finished edges of plates and sheets are specified in the contract or purchase order, the following descriptions shall apply:

"Square edge" material shall be supplied with finished edge, with sharp square corners, without bevel or rounding of any sort.

"Round edge" material shall be supplied with finished edge, semi-circular in form, the diameter of the circle forming the edge being equal to the thickness of the material.

"Round corners" material shall be supplied with square finished edge having corners rounded to a definite radius, which, unless otherwise specified in the contract or purchase order, may be any radius less than one-half the thickness of the material.

18. When no description of a required form of edge is given, edges such as would be left after slitting, sawing, or shearing will be acceptable.

19. Material in which injurious defects are revealed by manufacturing operations subsequent to acceptance shall be rejected. It shall be replaced by the contractor without cost to the purchaser.

VI. METHODS OF INSPECTION AND TESTS

1. An analysis of each melt or lot of material shall be furnished by the contractor, showing the percentages of the elements designated.

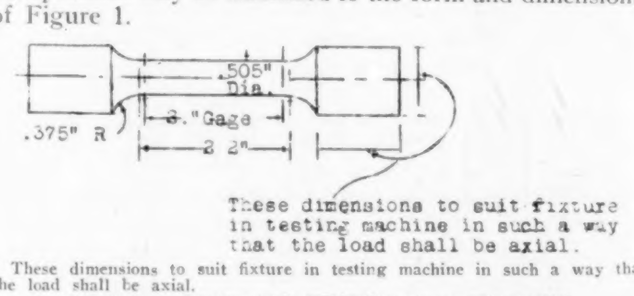
2. Check analysis may be made by the inspector, or through him by any Government laboratory or other designated representative, and without cost to the contractor.

3. Samples for check analyses shall be obtained from each lot of 5,000 pounds or fraction thereof of each size in the shipment. In the case of thin sheets and strips at least ten representative pieces shall be taken. In all other cases, at least four representative pieces shall be taken. From the pieces so taken, equal amounts of clean chips shall be obtained. These chips shall be combined and thoroughly mixed. The inspector shall forward for analysis not less than two ounces of the resultant mixture.

4. Unless otherwise specified in the contract or purchase order, one tension and one hammer test shall be made for every lot of 5,000 pounds or fraction thereof of each size in the shipment.

5. All rods and bars shall withstand being hammered hot to a fine point. Such test shall be made when deemed advisable by the inspector.

6. All rods, bars and shapes may be pulled in full size when practicable. When a machined specimen becomes necessary, enough metal may be removed from the pull section to meet the limitations of the testing machine, or the specimen may be machined to the form and dimensions of Figure 1.

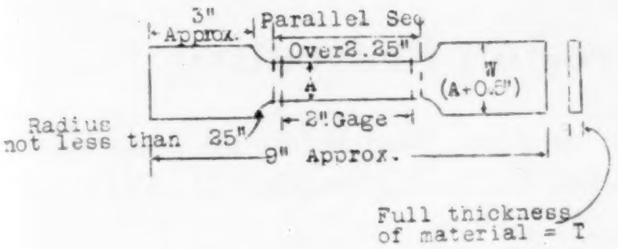


These dimensions to suit fixture in testing machine in such a way that the load shall be axial.

FIGURE 1—STANDARD TENSION TEST SPECIMEN

7. For rods, bars, and shapes up to 1½ inches in diameter or thickness, the axis of the test specimen shall coincide with the central axis of the piece; over 1½ inches, the axis shall be located midway between the center and surface of the piece.

8. The test specimen for plates, sheets, and strips shall be machined to the form and dimensions of Figure 2, and may be taken either with or across the grain.



Full thickness of material = T.
For material up to 0.5" thick, A = 0.5.
For material over 0.5" thick, A = T.

FIGURE 2—STANDARD FLAT TENSION TEST SPECIMEN

VII. PACKING AND MARKING OF SHIPMENTS

1. All material shall be properly separated by size when loaded for shipment.

2. Rods, bars, shapes may be bundled for shipment.

3. Plates, sheets, and strips shall be packed in boxes or crates sufficiently strong to protect them from injury and loss during shipment.

4. Each bundle, box or crate shall be legibly and indelibly marked with the weight of contents, name, brand, or trade mark of contractor, and the contract or purchase order number.

VIII. NOTES

1. Round, square, hexagonal, etc., sections are classed as rods. Rectangular sections having greater width than thickness are classed as bars. All others as shapes.

2. When material is ordered in the form of "plates," "sheets," or "strips," it will be understood that these terms refer merely to the general form and dimensions of the material and do not have any technical significance as to the method of manufacture.

3. Contracts or purchase orders for sheets and strips should state the purpose for which the material is to be used, as "for cupping," "for deep cupping," "for spinning," "for edgewise winding," "for bending at sharp right angles," etc.

4. The thickness of plates, sheets and strips should be stated in decimals of an inch.

5. Plates, sheets, and strips should be ordered in as narrow widths as can be used.

6. Copper Nickel Alloy, rolled or shaped, is suitable for parts requiring great strength or incorrodibility, such as propeller blade bolts, air pump and condenser bolts, pump rods, and sheathing for airplane propellers.

7. The following specifications and other authorities were consulted in preparing this specification:

Navy Department Specification No. 46M7c.
War Department Specification No. 57-168.
O. O. 470.1/2217. Int. Nickel Co. to Army Ordnance.

Standards for Brass Wire

I. GENERAL SPECIFICATIONS

United States Government General Specification for Metals, Federal Specifications Board specification No. 339, in effect on date of invitation for bids, shall form part of this specification.

II. GRADES

Brass wire shall be furnished in the following two grades, as specified: Grade A—Annealed, soft; Grade B—Spring temper.

III. MATERIAL AND WORKMANSHIP

1. Brass wire shall be made from virgin metals.

2. Scrap shall not be used in the manufacture, except as it may accumulate in the manufacturer's plant from materials of the same composition.

IV. GENERAL REQUIREMENTS

1. The wire shall be uniform in composition and quality, free from all injurious internal and surface defects, cracks, seams, laps, slivers, kinks and scale. It shall be new, bright, smooth and of uniform color and size.

PERMISSIBLE VARIATIONS IN DIAMETER

Diameter of Wire (inch)	Permissible Variation (inch)
0.025 to 0.0375	Plus or minus 0.0004
0.375 to 0.080	" " " 0.0005
0.080 to 0.187	" " " 0.0010
0.187 to 0.250	" " " 0.0015

V. DETAIL REQUIREMENTS

1. The chemical composition of the wire shall be as covered by Table 2:

Grade	Copper (per cent)	Lead Maximum (per cent)	Iron Maximum (per cent)	Zinc (per cent)
A	64 to 70	0.075	0.06	Remainder
B	70 to 74	0.075	0.06	Remainder

2. The wire shall meet the physical requirements of Table 3 following:

Grade		Tensile Strength Per Square inch (In Pounds) Under 0.080" Diam.		Over 0.080" to 0.150" Diam.		Over 0.150" Diam.	Bend Test
A	Min.	40,000	Min.	38,000	Min.	36,000	See Section
	Max.	56,000	Max.	54,000	Max.	52,000	VI (3)
B	Min.	120,000	Min.	118,000	Min.	116,000	below

3. Unless otherwise specified, brass wire shall be furnished in one-pound spools, five pound coils, and ten-pound coils.

4. Coils and spools shall be marked with the name, grade, size, and weight of the wire, and any other data desired by the purchaser.

VI. METHOD OF INSPECTION AND TESTS

1. One tension and one ductility test specimen shall be selected from each 500 pounds or fraction thereof.

2. One chemical analysis sample shall be taken to represent each 1,000 pounds or fraction thereof.

3. Ductility Test.

(*a*) Grade A wire shall be capable of being wrapped eight times around a rod having a diameter not more than five times the diameter of the wire. Upon release of the free end there shall be no appreciable spring to the wire.

(*b*) Grade B wire shall stand being bent cold 360° around a wire of the same diameter without showing cracks or fracture.

VII. PACKING AND MARKING OF SHIPMENTS

Shall be in accordance with best commercial practice, unless otherwise specified.

VIII. NOTES

1. The brass wire covered by this specification is intended for use only where commercial brass wire is applicable.

2. Grade A brass wire is used for hinge pins, beading, rivets, seizing, lamp guards, etc.

3. Grade B is used for springs, locking rings, etc.

4. Orders should state: (*a*) Grade of wire desired; (*b*) Diameter of wire in inches; (*c*) Net weight of coil or spool desired.

Additional proposed United States Government Master Specifications for copper nickel alloy castings and for black or galvanized fence wire can be obtained from the Federal Specifications Board, Washington, D. C.—Ed.

Chromium as a Corrosion Preventive

Failures in Chromium Plate and Their Causes. A Paper Read Before the Electroplaters' and Depositors' Technical Society in London, England, December 21, 1927.

By LESLIE WRIGHT

Recent years have seen rapid advances in the science of electrodeposition with the production of heavy nickel deposits and the perfection of the deposition of zinc and cadmium, great strides being made in the use of electrodeposited coatings for corrosion prevention. The possibility of the commercial deposition of chromium has caused a considerable impetus to be given to work on chromium deposits as a corrosion preventive.

The early hopes for the production of a permanent corrosion resistant coating of chromium have been hardly realized in practice, for much work that has been plated with chromium has failed in a surprising manner after having been in service for a very short time. The failure of some carefully stored cromium-plated brass articles, apparently perfect, in about a fortnight, forced the author to the conclusion that many factors, other than corrosion, were at work in causing the breakdown of chromium.

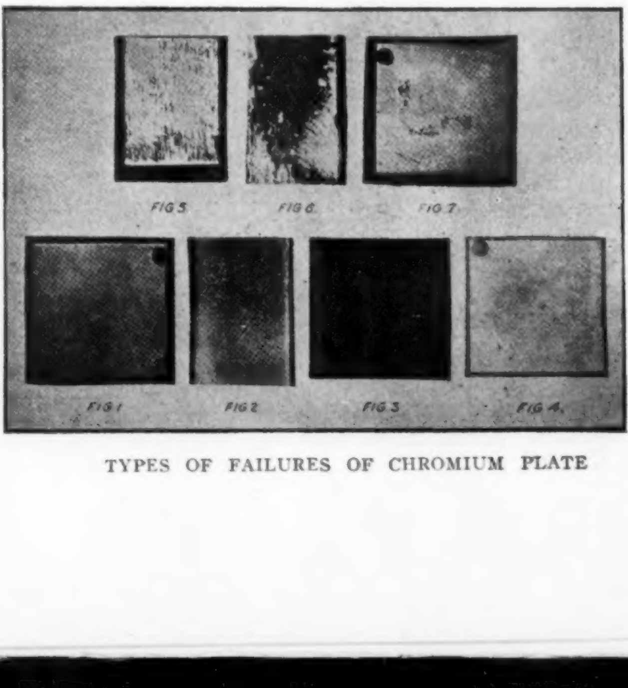
As more and more articles became available for examination, it was apparent that failure was not haphazard. It was found possible to put forward a number of definite types of failure and to attribute to each article a definite cause for its breakdown.

LOSS OF REFLECTING POWER OF THE POLISHED CHROMIUM SURFACE

This at first sight appeared to be due to the presence of a finely divided oxide film, but a closer examination revealed it to be due to two causes. One was found to be a fine adherent dust coating. The other was due to actual corrosion of the chromium surface. It was found possible to restore the lustre by polishing, but in specimens exposed for over three months, the loss of metal was so great that the remaining metallic chromium was removed. Fig. 1 illustrates this type of breakdown which is initial and not final.

PRESENCE OF PIN HOLES

Pin holes have been noticed on all types of work whatever the nature of the base metal. They have made their appearance on brass castings, with one hour's deposit from a warm solution, after an exposure of eight days. This type of failure was preceded by loss of reflecting power, and was more noticeable on the deposits from warm solutions than on those from cold solutions, and which had been polished. They were due to excessive loss of metal at localised points and their appearance was most marked on cast articles, where the appearance of pits and blow holes in the base metal accelerated their production.



TYPES OF FAILURES OF CHROMIUM PLATE

PRESENCE OF A GREEN SALT FILM

This type of failure was rarely met with on ordinary commercial work. Examples which came to notice had been at one time or another in a marine or a definitely acid atmosphere. The composition of the base metal had no effect on the rate of attack of the chromium surface, and it was concluded that the action was purely chemical leading to the formation of a hydrated oxy-salt. The presence of the salt film arrested further corrosion under atmospheric conditions.

BROWN OXIDE FILM

This film was noticed after three days on test pieces exposed to atmospheric conditions, yet on other articles it was three months before any signs appeared. The film was easy to remove in its initial stages, but difficult if allowed to remain for any length of time. Fig. 3 is a test piece from which a portion of the brown film has been removed, showing the chromium deposit to be intact underneath. It was felt that this brown film, which, while not common to all articles, was capable of formation on pieces which had all electrolyte removed, was due to the presence of a co-deposited oxide.

HAPHAZARD DISINTEGRATION OF THE DEPOSIT

This was noticed on domestic articles which had been plated, polished and carefully stored. The whole of the chromium deposit was found as a fine powder in the wrappings. Attempts to reproduce this type of failure on test pieces led the author to the conclusion that it was due to faulty treatment. It was possible to reproduce it by any of the three following methods:

(*a*) Inadequate treatment to deposition.
(*b*) Faulty striking of the article when plating.
(*c*) Introduction of impurities into the electrolyte.

Fig. 4 is a test piece from which the deposit was removed almost completely by plunging into hot water. It was then subjected to 10 days' exposure to atmospheric conditions and the corrosion of the brass soon completed the fracture of the remaining chromium.

FAILURE DUE TO PARALLEL CRACKS

This type of failure is illustrated by Fig. 5. There was a tendency for the cracks to appear on the projecting parts of the plated article and whilst the cracks themselves were parallel to each other, they were perpendicular to the greatest length. The base metal of the test piece had no effect on their initial appearance. Fig. 6 illustrates a brass plate with corrosion lines due to the cracking of the chromium plate in this manner. The author felt that the failure was neither due to the corrosion of the

base metal nor of the chromium, and it was concluded that they are due to internal stresses set up within the deposit.

BREAKDOWN OF THE DEPOSIT IN RINGS

This type is well illustrated by Fig. 7. No accompanying corrosion of the base metal was noticed in the initial stages. Careful study of this type of breakdown showed that it was always preceded by the "curving" of the deposit within the ring of failure. The breakdown was found to be hastened by shock. It was concluded that this failure was due to the presence of internal stresses within the deposit and that the ultimate end was hastened by fracture deposit. It was found most frequently upon brass articles.

BREAKDOWN IN THE FORM OF POLYGONAL PIECES

This type of breakdown was noticed almost exclusively upon spinning and tubes when the deposit was from a freshly prepared solution. The initial stage is marked by hair lines forming the honeycomb pattern. It was felt that this type of breakdown was due to the presence of internal stresses within the brass itself because when the stresses were relieved by subsequent annealing at 300°C. for 1 hour, this type of breakdown did not appear upon the specimen. On the other hand, this could be made common to all samples if the bath was an old one and the concentration of chromium dichromate had been allowed to become excessive. This failure will be dealt with more fully in a later paragraph.

IMPORTANCE OF PREVIOUS TREATMENT

From time to time the author has heard the impression that treatment previous to the actual deposition was unnecessary in the case of chromium. Whilst the actual evolution of hydrogen at the cathodes is excessive, it was found to exert no cleaning action. Upon immersion of the article in the electrolyte the deposition was instantaneous and, whatever the nature of the cathode surface, it was possible, in view of the high voltage and current density employed in chromium deposition to cover it with chromium.

Various test pieces, enumerated in the original paper, were plated with chromium and their eventual break down carefully studied.

The author feels that the greatest trouble is caused by the lack of union between the deposit and the base metal. It can be safely said that the majority of operators have not achieved the standard of adhesion on ordinary work that the corrosion expert has achieved with nickel on aluminum. This lack of union between the deposit and the base metal has been found to be fatal in the case of chromium. The space existing between the deposit and the base metal was found to present an air gap which accelerated the formation of corrosion products and led to the rapid breakdown of the deposit. Such a brittle sheath is easy to rupture and can be removed in large flakes.

THE DEPOSITION OF CHROMIUM

In the deposition of chromium, the high current densities required have, in many cases, resulted in a very high electrode voltage. The author has seen, on many occasions, vats operating with a voltage as high as 18 volts across the electrodes. It has been found that the initial voltage at which the article was struck played a very important part in the life of the deposit.

When cold solutions were operated with a high initial voltage of 15, it was found that, whilst the chromium was deposited about the edge of the plate, the centre deposit consisted of a very fine oxide layer. This brown oxide was quite adherent to the base metal, and, upon analysis proved to approximate to the compound chromic dichromate described by Liebreich as being a constituent of the bath. It was found possible to obviate its formation by reducing the striking voltage to 8 volts, and by complete immersion of the article previous to the application of the current.

COMPOSITION OF THE DEPOSIT

The chromium deposits which formed the material for this investigation were obtained by the electrolysis of aqueous solutions of chromic acid. The concentration was varied from 250 to 600 grams of CrO_3 to the litre, and the additions tried included sulphuric acid, chromic sulphate, chromic carbonate, and chromic dichromate, produced in a number of ways. It was found possible to vary the type of the deposit by alteration of the temperature and electrical factors. This variation of type was apparently of a quantitative rather than a qualitative nature.

Quantitative examination of the deposits revealed very little true difference as far as the nature of the metallic chromium. The photo-micrographs showed a steady decrease in the grain size of the deposit. Analyses always revealed three essential constituents of the deposit, whatever the conditions of deposition or the solution from which they were made. These were chromium, oxygen and hydrogen, and they varied in quantity from type to type.

OXYGEN CONTENT

The nature of the process, namely, cathodic deposition, made it very unlikely that any gaseous oxygen was present in the deposit. The oxygen was always estimated in a combined state as Cr_2O_3. It was felt that occluded electrolyte could be a possible source of such Cr_2O_3. Some well washed chromium, stripped from a brass plate was pulverized and treated, first with dilute sodium hydroxide, and then with silver nitrate solution, but such a sensitive indicator failed to reveal any free chromic acid. But one thing of interest was discovered. Upon removal of the chromium deposit from brass and iron castings it was found that no amount of previous treatment of the plated article completely removed the occluded electrolyte from the pores of the base metal. The most successful method was to make the article the cathode in a caustic soda solution for one minute, and then to dip into a nitro-sulphuric acid mixture.

It was found possible to dissolve the stripped chromium in dilute hydrochloric acid, although with some samples some difficulty was experienced with the last portion. This fact made it appear unlikely that the oxide existed as Cr_2O_3. The author is of the opinion that the oxygen content of the chromium deposit exists, combined with chromium as chromium dichromate. This is co-deposited with chromium. Fig. 13 is a photo-micrograph of an iridescent type of deposit, and it was felt that the black polygonal markings around crystal aggregates showed the way in which the oxide was contained in the metal. This type of deposit was the hardest obtained, and it was impossible to obtain a good polish on the surface. It rapidly broke down under atmospheric corrosion, but proved itself a valuable resistant to wear and tear when properly applied to the base metal. Prolonged treatment of the article as the cathode in 30 per cent. NaOH solution minimized the amount of oxide (see Fig. 14). This iridescent deposit was so called because it reflected light in a peculiar manner.

HYDROGEN CONTENT

Electro-deposited chromium contains hydrogen, and when some samples were heated the hydrogen ignited. Experiments on the cathode efficiency proved it to decrease with decrease in current density. The temperature

rise of the solution was noted, and when correlated with the energy put into the solution it was found that the temperature increases varied little from experiment to experiment. It was felt that the difference in weight of the chromium might be supplied by the increase on the hydrogen content of the deposit. This was found to be so. It is outside the scope of this paper to give the experiments in full, and it is hoped to publish them elsewhere at an early date.

The fact proved was that the hydrogen content of the deposit varied approximately from 1000 volumes contained by the true matt deposit to 2000 contained by the milky bright deposit.

By a steady increase in the sulphuric acid content of the solution, it is possible to increase the hydrogen content of the deposit, and as the hardness of the deposit also increased, the author feels that for specimens possessing the same grain size the hardness is a fundamental property of the hydrogen content.

In the course of the removal of unsatisfactory chromium deposits by means of stripping in hydrochloric acid, it was noticed that different deposits, irrespective of thickness, took different times in which to be dissolved. It was apparent that the hydrogen content had a marked effect in activating the chromium, and making it more prone to acid attack.

CHROMIUM CONTENT

It has been pointed out that the chromium obtained under different conditions differed considerably in appearance and purity. It has been found impossible to completely remove all impurities from a deposit possessing a sheened or iridescent appearance, and data obtained from such impure deposits were not trustworthy. Attempts to etch chromium gave disappointing results, the only method which proved itself satisfactory being the one recommended by Adcock. The photomicrographs shown are of unetched deposits by 1000, and they illustrate a steady decrease in grain size with increase in the current density. The color of the matt deposit differs from a blue grey to a silvery white with increase in current density. The hardness increases with decrease of grain size and increase of current density.

POROSITY OF THE DEPOSIT

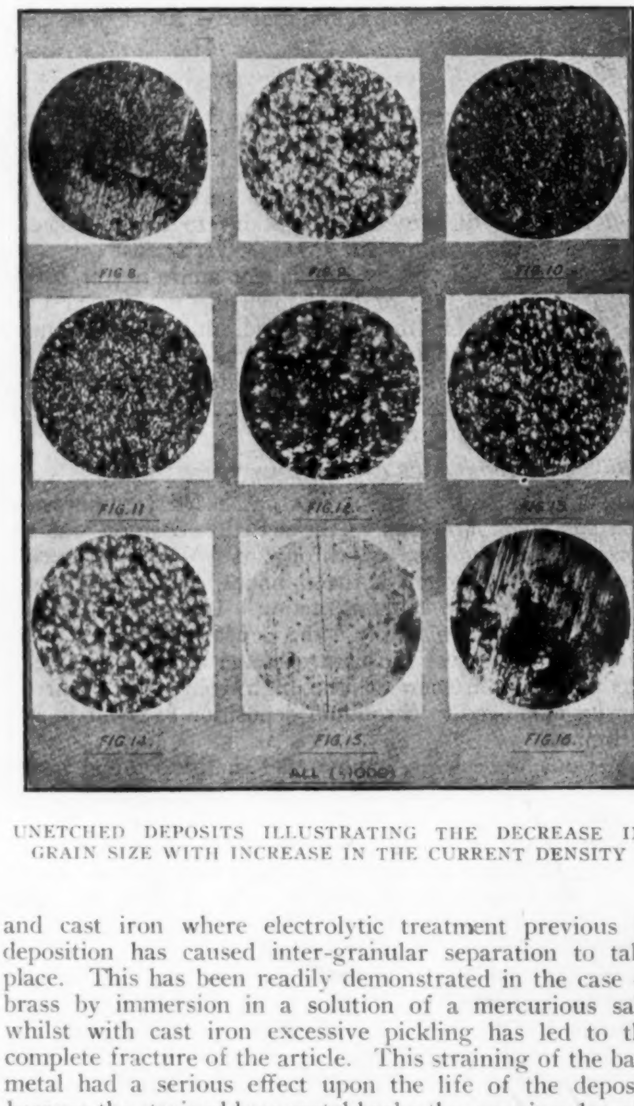
It soon became apparent that electro-deposited chromium was of a very porous nature. As these deposits contain occluded oxide and hydrogen, it was felt that they were probably of a pitted and porous nature. Under ordinary conditions no evidence of pits was found, but in attempts to etch the deposited chromium using the method advocated by Adcock, of plunging the specimen pre-heated to 300°C. into concentrated sulphuric acid, pits were always found in deposits possessing a sheened or iridescent appearance. Fig. 15 is a photomicrograph by 100° of a chromium deposit which had been polished and given the treatment previously outlined.

The pits, even in thick deposits, do not persist to any considerable depth, because when the surface layer of the material was removed and the specimen then given a second treatment, new pits appeared in different places. Bright deposits obtained from warm solutions permitted the ready oozing through of the corrosion products to a greater extent than a true matt deposit or a deposit which had had its surface flowed by means of polishing. Fig. 16 illustrates the presence of steel corrosion products which had pushed their way through a polished chromium deposit. It has been found possible to remove the first rust marks seen on steel which had been given a chromium deposit of 2/10,000 in. and to the naked eye there appeared no evidence of any rupture of the deposit. The porosity of the deposited chromium was, however, demonstrated by experiment.

PRESENCE OF INTERNAL STRESSES

The stressed condition appears to be normal in electrodeposited metals, but the base material also develops stresses during preparatory treatment.

This has been noticed particularly upon brass spinnings



UNETCHED DEPOSITS ILLUSTRATING THE DECREASE IN GRAIN SIZE WITH INCREASE IN THE CURRENT DENSITY

and cast iron where electrolytic treatment previous to deposition has caused inter-granular separation to take place. This has been readily demonstrated in the case of brass by immersion in a solution of a mercurious salt, whilst with cast iron excessive pickling has led to the complete fracture of the article. This straining of the base metal had a serious effect upon the life of the deposit, because the strained base metal broke the covering deposit.

Subsequent annealing of the deposit and brass at 300°C. for one hour brought about a marked improvement in the life of the deposit.

Even during deposition it was found that if contact was established at more than one point the metal sheet exhibited stresses when the deposit was removed. These stresses will be accentuated in chromium deposition by the heavy currents employed.

Stoney has proved that an increase in the temperature of operation of the bath reduced the tendency to stress formation in the case of nickel. But no proof of this was found in the case of chromium; because it was found that increase in the temperature of the bath beyond 30°C. gave a deposit possessing a greater amount of co-deposited hydrogen than that from a cold bath. This excess of occluded hydrogen more than compensates for any benefit obtained by the operation of a warm solution.

The Relation of Polishing to Chromium Plating

A Plea for Better Polishing—A Paper Read Before the Annual Meeting of the Philadelphia Branch, American Electroplaters' Society, November 19, 1927.

By P. W. ELLWANGER

I wish to emphasize this startling fact, that whereas polishing and buffing of the base metals for nickel plating or any other common metals, should be of a high standard, when chromium plating is to be used, polishing and buffing must be done with much more care than has usually been exercised. The advent of chromium has awakened in the mind of the "boss" that he has a polishing and plating department. The investment in chromium plating equipment is much greater than for copper or nickel plating, and that has brought to the executive's attention this startling fact, that rejections against the cost of ordinary products are such that it isn't a question of what the polishing foreman wants to do or what the plater has done; it is a matter of dollars and cents plus the amount of work that has been turned out.

An amusing illustration of my meaning is the following. Certain mid-western manufacturers of brass castings have been known for their poor finishes. They put in a chromium plant, and when their first castings were finished and delivered to their customers, they were immediately returned as unsatisfactory. After the boss had made his investment in chromium, you can appreciate that he was on the job to find out why those shipments had been returned. An investigation showed that in polishing and buffing these castings, no change had been made over their same preparation for nickel, bringing home the fact that for years these same castings had not been properly polished or buffed for nickel. When an additional polishing operation had been added and the proper buffing compositions and buffs had been worked out for this job, then the boss realized why he had lost so much business to some of his competitors, and why his foreman plater had been pleading for years for more efficiency in the polishing and buffing room, instead of trying to plate over abrasive and wheel marks.

And I think right there is a point the foreman plater should take into consideration. I think the advent of chromium has done more to bring out the real work that a plater can do, and has been doing, than any other event in the metal finishing industry in the last two decades. All of us have always known and appreciated that the higher the finish that is put on the base, the higher and better will be the finish on the plate. Yet chromium has brought home this fact in only a few months, whereas the best minds in this industry have preached this one thought for many years. Chromium immediately reflects the minor abrasions not cut out in the polishing and buffing operations; you can not get away from them, nor can you cover them; they have to be taken out of the base metal. There are many instances of these same marks passing in a nickel inspection that cannot be passed in chromium inspection.

Take, for instance, a concern that has gone to chromium plating of headlight reflectors that have heretofore been silver plated. They have been run directly to a tripoli wheel, color buffed and plated. These same reflectors (now chromium plated), in order to pass inspection, were oiled out with 180 emery, then tripoli buffed, adding an operation, but not adding to production cost, as the saving in tripoli and buffs, and the percentage of rejections was so materially decreased as to overcome the cost of this additional operation.

In steel radiator shells there have been added one or two polishing operations, one of the largest production jobs now being five polishing operations; then run into a 50 minute duplex copper and highly buffed with a cut and color composition; then into a 50 minute nickel and the nickel highly buffed; and then chromium plated. This is seemingly a long drawn out series of operations, but as the rejections have been brought down to a minimum, the cost is much less than attempting to do the work a second or third time.

It has been generally contended that chromium deposited over copper or nickel is likely to be the practice for the immediate future, anyway. So it is necessary that the nickel and copper be most thoroughly buffed to cover the pores, and this angle of the preparations should not be overlooked.

I have in mind a manufacturer of plumbers' brass goods, whose operations consisted of two polishing operations, starting with 60 and finishing with 120, then buffing with tripoli and color buffing before plating. It is a physical impossibility to cut out all 60 lines with No. 120; nor is it possible to cut all 120 marks with tripoli. This left some of the 60 marks and some of the 120 marks as the casting went to the coloring wheel. This has been their practice all the time the castings were finished in nickel. After putting in chromium their rejections were so great that they had to call for help. Additional polishing operations and adequate buffing operations were recommended and are now being carried out in an experimental way, but their work is passing inspection and no doubt these recommendations will be carried out.

I could go on citing many other illustrations of the various industries' reactions to the changing of polishing and buffing operations, but the great majority are still in the experimental stage, or in the stage where they have not had the chance to swing to these recommendations. Yet, when the great number of chromium installations really swing into live competition, when all the competitive articles really reach the consuming or buying market, then will your various manufacturers of chromium plated goods swing to the changing or bettering of their polishing and buffing operations.

The foreman plater today is a more important part of this industry than at any time since the advent of the American Electroplaters' Society. Chromium plating has been the cause of much research work, endless hours of experiment, and is being exploited so rapidly that any question, other than that of chromium plating, is of secondary consideration at this time. And the plater, in the final anaylsis, shoulders all the responsibility for the successful completion of the chromium job. All of you who have that inherent pride to get out the very best job that it is possible to get out, will see that the work that you are to chromium plate comes to you properly finished. And properly finished means more now than at any time since the advent of plating.

The finishing or color buffing of the chromium plate is an operation of minor consequence if the preparatory polishing and buffing operations are carried out along the ideas set forth in the preceding paragraphs, and if the plate is not so hard as to necessitate the use of harsh ingredients in the coloring composition.

Many of the minor things that we had to overcome in the first experiments of color buffing chromium plate were caused by the lack of proper preparatory polishing; the lines left in the base metal before plating often confused the color buffer into the belief that these lines or scratches were put there by the finishing compound. Plate that had been burned around the edges was another cause of considerable grief, until it was shown that the color could be brought out, except in very severe cases.

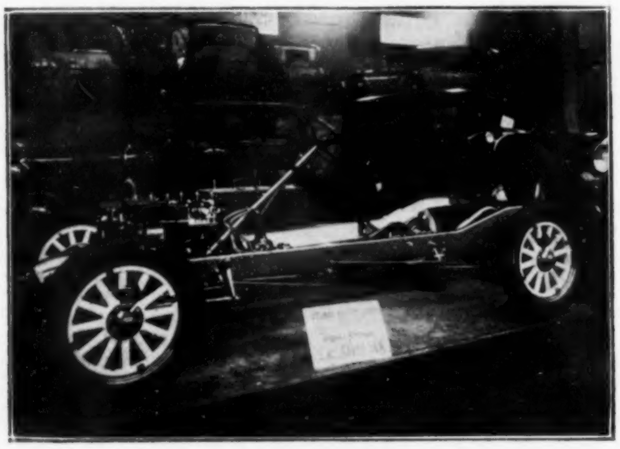
In some of the largest production jobs in chromium plating, the use of the proper color buffing operations and compositions has salvaged thousands of pieces that had been rejected and were to have been replated; rejected because of water spots and for burned places, in many instances, where a hard plate has been deposited. There seemed a necessity for a hard, sharp coloring composition. Yet in the writer's opinion this kind of buffing material is not necessary. His own experiences having been limited to absolutely one grade of composition, and that composition has worked out most successfully in practically all cases. I am not recommending a "cure-all." Speeds, size, quality of buffs and the intelligence of the plating and polishing foremen have made these successes possible. In the end, every one of you has an individual problem to work out in your own shop on the finishing of chromium.

Gold Plated Auto Chassis

By FRANCIS DICKIE

The first automobile chassis in the history of the world to be plated with 24 carat gold was a feature of the great exhibition of automobiles in Paris recently. The chassis was valued at $30,000. In comparison, the most splendid and costly equipages of the greatest of ancient kings were poor cheap things. Every particle of the chassis was plated with 24 carat gold; the motor was cut open to show this remarkable accomplishment. Upon the first day an emergency squad of police had to keep the crowd in order around the car.

The car, an Erskine Six, was manufactured by the



GOLD PLATED ERSKINE SIX CHASSIS

Studebaker Corporation of America and exhibited for the first time in Paris. The chassis underwent hundreds of hours of preparation for the plating. Each of the 2,031 individual parts was first given a specially required polishing and heavy brass plating, at a preliminary cost of $5,000. A special tank was built for the gold plating to fit the size of the chassis, as never before had an object of this size been similarly treated. In giving the frame its gold bath, 12 anodes, weighing 340 ounces and valued at $7,000, were used. After the frame was gold plated, each separate attachment had to be treated. A total of 25,149 square inches were gold plated. The work required 250 hours. Following the gold plating process the chassis received another special polishing, was coated with oil, and then assembled. This required 300 hours of skilled labor.

In the construction and finish the same delicacy and precision as used in manufacturing a watch were used, and the finished work is said to be a masterpiece in automobile building.

When the precious car was shipped from the show it was carefully wrapped in layers of cotton, over which heavy water proof paper was placed to prevent scratching of the costly finish.

Stripping Silver

Q.—I use sulphuric and nitric acid for my silver strip. I tried to get the silver out in silver chloride form so I added muriatic acid but I got a black and muddy precipitation. Please tell me how I can get the silver out of the strip solution without fusing it.

A.—We assume that you used the sulphuric and nitric acid strip for the purpose of removing silver and not attacking the base metal. Your procedure then should be as follows. Remove clear silver acid solution from jar in which stripping took place. This is for two purposes: one to make sure that no brass, copper or nickel articles are in the bottom of the jar, and the other that no impure sediments become later mixed with silver chloride. Make a concentrated solution of sodium chloride (ordinary table salt). Dilute the acid silver solution with water, or better still, the clear acid silver solution should be added to an equal volume of water. Add the salt solution to the acid solution. A white curdy precipitate will form. This should be continued until a few drops of the salt solution no longer produces a precipitate. After allowing silver chloride to settle, the clear liquid is drawn off and the silver chloride washed with cold water until the water no longer shows an acid reaction with blue litmus paper—JOSEPH HAAS.

Copper Plating

Q.—I am desirous of receiving information regarding copper plating. At present I am using 10 ozs. sodium cyanide; 5 ozs. carbonate copper; 4 ozs. sodium carbonate; ½ oz. sodium hyposulphite per gallon. I use 3½ volts and solutions temperature is 120° F. The anodes on this tank get black as soon as it is not used. The color of the solution is a real yellowish green. A greenish scum is always forming on the negative rods. The articles are poorly plated and get really black at the bottom only. The tank is 5' deep, 2' wide, 8½' long.

A.—Your formula does not contain any cyanide for "free cyanide." You are using only enough cyanide to dissolve 5 ozs. of copper carbonate. Add 2 ozs. per gallon more of cyanide. The lack of free cyanide accounts for the color of your solution and the green scum.—JOSEPH HAAS.

The Growth of Industrial Cleaning

The History, Chemistry and Mechanics of Metal Cleaners—Part I

Written for The Metal Industry by D. J. BENOLIEL, International Chemical Company, Philadelphia, Pa.

Industrial cleaning signifies handling cleaning problems in every industry—metal, textile, oil, paint, gas, railroad, meat packing, and so on. Each of these many trades has its own peculiar cleaning problems incidental to proper manufacture and maintenance and, where before these propositions were met haphazardly and improperly, today they are being handled excellently and at low cost by the aid of this new science.

Because metal cleaning is the "grandpapa" of all industrial cleaning, it will be most interesting to trace the development of the science in the metal trade.

THE HISTORY OF CLEANER MANUFACTURE

At the beginning of the present century, cleaning methods and materials in every industry were of the crudest, and no individual or organization had ever evidenced any interest in bettering conditions. Proper cleansing is vital to the manufacture of metal goods, and although great improvements had been made in machines, unsatisfactory cleaning greatly retarded production. So it is not strange that industrial cleaning had its inception herein.

Around 1900 this important phase of metal manufacturing was taken care of by trade-named "lyes," soda ash, sal soda, whale oil soap, wood ash, benzine, and gasoline. Quite an inefficient array, is it not? Manufacturers were puttering along getting very indifferent results at high costs.

Just about this time a large chemical company in Niagara Falls, N. Y., started to manufacture caustic potash by the electrolytic method. This was the first caustic potash ever made in America. Of course, it had a very limited market, so the manufacturers were forced to look around for an outlet. A large silver company was nearby, and an investigation showed that this plant used a caustic soda for cleaning. Caustic potash was given a thorough practical test and proved to be a much better and cheaper cleanser than the soda.

This first success so encouraged the potash manufacturers that soon potash was introduced to metal trades throughout the Middle Atlantic and New England States. Those first shipments of potash from the Falls were a low grade judged analytically. That is to say, the first potash shipped was not very high in caustic content. However, the manufacturer rapidly made another potash much higher in caustic content and started shipping it to the trade. Then trouble started. Complaints started coming in rapidly. One firm reported "the potash is not cleaning." Another firm reported "the potash is now tarnishing badly. Send us some of your good potash." As a matter of fact, everyone seemed to be writing about the potash so the "Big Chief" packed his bag and made a trip throughout the New England States. Investigation proved that whereas the early "poor" grades of potash worked, the better grade failed. This led to a systematic study of the lyes then upon the market and it was found that the lyes that contained other ingredients besides caustic soda seemed to clean better than pure caustic soda. So it must have been with potash.

He started to do a great deal of development work in order to determine just what grade of potash would give the best results on metal cleaning. It was argued that the foreign salts present in the early grades of potash were catalytic and emulsifying agents (buffer salts) that quickened the chemical action, prevented tarnishing and aided in handling the mineral oils that might be present. A series of practical experiments verified this theory, and thus it became evident that combinations of alkalies and salts were better than pure alkalies. With that came the development of chemically made first sorts potashes, which were carefully compounded and graded according to the kind of metals, oils, and operating conditions they were to meet.

This was in 1905, and in that year the "Big Chief" from Niagara Falls came to Camden, N. J., and founded the first company ever to specialize in scientific industrial cleaning. Chemists, laboratory and field men were gathering data, running any number of experiments, and perfecting many new compounds of caustic potashes, caustic sodas, carbonates, phosphates, special soaps, and many mineral salts. In 1920 a new plant and general offices were opened in Philadelphia.

About 1911 a second company entered the metal cleaning field, and a few years later a third company perfected a metal cleaner. Several platers' supply houses were manufacturing graded lyes, and these conditions lasted until the boom times of 1918-1919 when salesmen broke away from the older established houses and started, with more or less success, their own businesses. Thus the country became flooded with "cleaners" of various description and value. But with the coming of "lean years" in industry, a great many of the newcomers passed out of existence and most of the trade remained with the three pioneer concerns.

So it is evident that industrial cleaning, as we know it today, had its birth in the metal industries, and even now the great bulk of really scientific work is being carried on in this field where cleanliness is vital to proper production. Strange as it may seem the many and varied opportunities for cleaning in other industries were not seen and appreciated at first. The swing-over was rather gradual and came about through force of circumstances, such as a metal concern asking for a product to clean its floors, equipment or restaurant dishes. These inquiries opened a new vista and, using their hard won experience gained from years of careful work in the metal field, the experts concocted new cleansers to meet new problems.

Then every industry was scientifically studied. Trained engineers called upon every conceivable trade, studied every possible cleaning problem and reported to headquarters. This vast fund of information was classified, materials were perfected to meet each proposition, and numerous laboratory and field tests were made.

Today the various cleaning problems met with in every industry are well known and understood by real experts in industrial cleaning.

TECHNOLOGY OF CLEANING MATERIALS

To clean the various metals efficiently and economically before plating, japanning, galvanizing, and stocking, etc., is a much more difficult problem than is generally considered. Of course, if the work is to be scrubbed the operation is relatively easy. However, present-day pro-

duction methods call for great speed with a minimum amount of labor cost. Naturally this greatly complicates the problem. It can easily be seen that the proper cleaning material to be used depends upon the following factors:

1. The kind of oils, grease, or foreign materials to be removed.
2. The composition of the metal to be cleaned.
3. The shape and size of the piece to be cleaned.
4. Operation that is to be performed on the piece after clearing.
5. Mechanical equipment available.
6. The temperature of the cleaning bath.

All these factors together with the personal preference of the operator as to just how he wants the cleaner to work must be taken into consideration before one can scientifically recommend the product to be used.

Before a piece of buffed brass work is lacquered it must be rendered chemically clean. The cleaner employed must remove the buffing composition, give a chemically clean surface, and at the same time leave the brass in its original bright condition, so that it can be immediately lacquered. However, if a piece of steel is to be cleaned before plating, the proposition is a much easier one, for it is almost impossible to injure the surface of steel by using too strong a cleansing medium. Therefore, a rapid cleanser is employed that will leave the surface chemically clean. If the surface is not chemically clean, the metal deposit will peel off when the article is buffed. But if this same piece of steel is to be cleaned before machine operation or put away for stocking, or packed for shipment, this same cleaner would be entirely unsatisfactory, as it would leave the work chemically clean. A chemically clean piece of steel starts to rust immediately and considerable trouble would result.

When one considers the large variety of metals that are to be cleaned, such as iron, steel, brass, zinc, aluminum, die-castings, plated silver, plated nickel, etc., and when one considers the large number of materials to be removed, such as enamel, mineral oils, buffing compositions, he can then readily see that it is impossible to clean all classes of work with maximum efficiency and economy by means of a few cleansers. Nevertheless, this is just what a number of concerns actually attempt to do. The "cure-all" cleaner has as yet never been perfected, and most cleaning chemists do not see how it ever can be perfected. However, one cleaning material can handle a number of problems efficiently and economically; but when too many complications arise, each case must be carefully studied by experts in order to insure the best method or material for that particular operation.

Materials that are generally used for cleaning metal work can be divided into five classes:

1. Those that clean by solution.
2. Those that clean by chemical action.
3. Those that clean by physical action (emulsification.)
4. Those that clean by mechanical action.
5. Those that clean by combinations of the above.

A great many cleansers usually belong in more than one class and very often it is difficult to place them accurately. This classification, however, will be found useful in making a systematic study of cleansing agents.

Materials that clean by solution act by dissolving the oils from the work. The oil dissolved remains suspended in the cleaner used. To this class belong the solvents such as gasoline, benzine, alcohol, turpentine, carbon tetrachloride, etc. When these cleaners are used, the particles removed are not changed in composition and, therefore, remain distributed through the entire mass of cleaner. Most cleaners of this kind are volatile, and it is therefore possible in a great many cases to distill and recover them. Benzine, naptha, and kerosene are the cleaners belonging to this group that are used to a great extent in factories for cleaning metal work. They are very objectionable owing to their being inflammable and are not economical due to their volatile nature. They have the advantage of dissolving, rapidly, the bulk of the material to be removed. They cannot, however, make the work chemically clean so that the articles could be plated, tinned, or japanned.

In the majority of cases where benzine is used for cleaning metal work, it is adopted because the concerns apparently do not know of a substitute for this article. Its use depends to a great extent upon ignorance. The reason articles cleaned in the material of the first class cannot be plated is due to the fact that a small deposit of oil is left on the work after the solvent has had a chance to evaporate.

The cleaners of the second class act chemically. They combine directly with the oils and greases upon the work which is being cleaned. The new material thus formed goes into the solution. To this class belong such materials as caustic potash, caustic soda, potassium cyanide, acids, and similar materials. A common example of this type of cleaning is the combination of caustic soda with the grease on a metal surface thus making a soap. This goes into the solution and aids the cleaning. The soap is entirely different from the caustic or the grease removed.

Most cleaners of the second class act rapidly, and they must be used in a hot solution. Of course, this type of cleaner is preferable to use but materials of this class cannot handle mineral oil as oils of this type cannot be saponified. After metals come from a cleaning solution of this second class they are chemically clean and are ready for plating, japanning, etc.

The emulsifiers or cleaners of the third class combine physically with the materials to be removed. To this class belong such materials as soap or soap compounds, phosphates, silicates, and many other mineral salts. Their emulsifying power can be explained in the realm of chemistry by what is termed "colloidal action."

Cleaners of the fourth class depend upon mechanical agitation for results. This mechanical agitation can be caused by something incorporated in the chemical compound or by the way the cleaner is manipulated. For example, any cleaner of the second or third class that is used in combination with electric current automatically falls into the fourth class, inasmuch as the current releases hydrogen gas which aids mechanically in throwing off the grease.

However, there is a separate group of materials containing abrasives which distinctly belong in the fourth class, although they may at the same time have chemical and physical properties which would put them in the second and third classes. The ideal cleaner of this type is one that contains an abrasive that is light, flaky, and absorbent. The compound should not have a high percentage of this abrasive but a low percentage to insure that it all floats throughout the cleaning solution and gives an actual brushing action on the surface of the metal.

Now for the fifth class. Most of the trade-name cleaners on the market are combinations of the second and third classes of cleaners, and when a chemically clean surface is needed, these combinations are most effective. Of course, if the combination cleaner falling in both the second and third classes is used with an electric current, with brush, or contains an abrasive, it would therefore also fall in the fourth class.

This article will be concluded in an early issue.—Ed.

Review of the Silver Market for 1927

Abstracted from the Annual Booklet Published by HANDY & HARMAN, New York

At the close of 1926, although production showed a slight increase in spite of lower values, and coinage requirements were small, economic conditions might have been considered favorable to higher prices for the white metal; because China's powers of absorption had improved during the year despite the uncertain conditions prevailing in the country, and the demand from India was definitely increasing at the lower price level. Opposed to these favorable economic factors was the bearish sentiment induced by the possibility of sales of silver by the Indian Government.

TREND OF PRICES

Keeping this situation in mind it will be interesting to follow the fluctuations of the market throughout the year. Opening quotations were 54 cents in New York and 25 1/16 pence in London, and on January 5th the low rates for the year occurred, namely 53⅝ cents and 24¾ pence. From this point the market advanced sharply until February 3rd when the 1927 peak prices of 60 cents and 28 pence were quoted, thus establishing the year's low and high figures within a period of thirty days.

However, offierings from China forced prices down until the middle of February, when a temporary rally occurred based on bazaar support; but it was short lived and the downward trend was again resumed, until on March 14th silver touched 54¼ cents in New York and 25 3/16 pence in London.

From the middle of March until the early part of April quotations advanced again, but from then on until the latter part of July the market fluctuated aimlessly within relatively narrow limits.

On August 2nd the Indian Government made the following announcement:

> The Government of India has recently sold silver bullion held in the Indian Paper Currency Reserve to an amount of approximately 9,200,000 fine ounces, representing the total stock of fine silver held by the Government of India. As this silver ceases to form part of the Currency Reserve its place will be taken by Indian Government rupee securities which will be reduced as the sterling proceeds from the sale of silver are received.

The market immediately weakened, and a sharp decline set in which carried prices down to 54⅛ cents and 24 15/16 pence by August 8th. On the 11th and 22nd of August silver again touched the low rates above quoted. At this level support developed, and thereafter the market advanced steadily until the early part of December. During the closing month of the year prices receded slightly, final quotations being 57½ cents and 26½ pence, but silver could by no means be called weak.

PRODUCTION IN 1927

From information now available it appears that world production in 1927 practically equalled that of 1926, which established a record for all time. Our estimate is 251,000,000 ounces, of which the United States supplied 59,000,000 ounces, Mexico 102,500,000 ounces and Canada 22,200,000 ounces. The average price of silver for the year was 56.37 cents, a figure sufficiently below any level prevailing recently to cause some curtailment in the production of silver from dry and silicious ores, but this was offset by larger amounts of silver becoming available as a by-product of copper and lead ores.

In addition to new production, further supplies appeared as a result of the debasement of British coinage, sales of demonetized coin by continental countries, and particularly the sales by the Indian Government of over 9,000,000 ounces.

COINAGE DEMAND

The U. S. Department of Commerce summarizes conditions in India during 1927 as follows.

> Business in India was generally well maintained throughout the year. Crop yields were good, foreign demand for export commodities kept prices at a satisfactory level, and the farmers enjoyed the sixth successive favorable monsoon.

As a result of these conditions demand for the white metal continued, and we estimate India's consumption for the year at 90,000,000 ounces.

Again quoting the U. S. Department of Commerce we have this picture of the other great silver using country of the Orient:

> China during 1927 continued under the usual handicaps of recent years—political unrest, military operations, strikes, embargoes, disrupted transportation, excessive tax impositions, and depreciated currencies—all serious obstacles to any normal economic or trade development. Notwithstanding these adverse circumstances, which in any other country would have been sufficient to strangle trade completely, China's exports showed increases in many commodities and its imports, while appreciably decreased when compared with 1926, have not been wholly disappointing.

As a matter of fact China's absorption of silver for 1927 showed a considerable increase over recent years, bullion imports amounting to 85,000,000 ounces according to data now available.

Outside of China, coinage requirements for the year were negligible. No new silver was minted by Great Britain, India or Mexico, and the United States Mint Service acquired in the open market and in deposits approximately 6,500,000 fine ounces, all for use in the manufacture of subsidiary silver pieces. Small purchases were made by some of the countries abroad, but on the other hand the Bank of France is reported to have sold in India over 3,000,000 ounces resulting from demonetized French coin.

INDUSTRIAL DEMAND

The year 1927 was not a particularly good one in the jewelry and allied industries, as present figures indicate a falling off in volume of general business. Notwithstanding this condition the amount of silver consumed in the silverware, chemical and photographic trades remained practically unchanged from 1926. We estimate total consumption for the year in the United States and Canada at 33,500,000 ounces. Replenishment of stocks depleted by holiday buying, together with more aggressive advertising and sales effort, appear to make the domestic industrial outlook for 1928 favorable.

During 1927 England used 6,500,000 ounces in the arts and manufactures, which was a slight increase over the previous year.

With little likelihood of any large demand for coinage and increased consumption by the arts and industries, the Far East continues to be the principal factor in determining the price of silver.

CONCLUSION

The year 1927 furnished a striking example of China's remarkable ability to continue trade under the most try-

ing internal conditions, and as serious international complications appear less likely since the removal of Bolshevist influence in Chinese affairs, we believe the demand for silver from this great Oriental buyer will be well maintained.

There is considerable speculation as to what method will be pursued in order to effect further sales in India. The feeling seems to be general that the Indian Government will take advantage of every favorable opportunity to make further sales; however, as their evident intention is to accomplish such sales with as little harmful effect upon the market as possible, and in view of general economic conditions which influence silver, we should not be surprised if the average price level for the white metal during 1928 were higher than that which prevailed during the current year.

WORLD PRODUCTION

(In millions of fine ounces)

	1927	1926
Production:		
United States	59.	62.7
Mexico	102.5	98.3
Canada	22.2	22.4
All other countries	67.3	70.2
Total Production	251.	253.6
Other Supplies:		
Debasement of British coinage	1.2	.7
Demonetized French coin	3.8	—
Sales by Indian Government	9.2	—
Total	265.2	254.3

WORLD CONSUMPTION

	1927	1926
India:		
Shipments from the United States, Canada and England	82.	91.6
Sales by Indian and French Governments	13.	—
	95.	91.6
Less Shipments India to China	5.	—
Total India	90.	91.6
China:		
Shipments		
from the United States, Canada and England	71.	81.5
from India and Japan	14.	—
	85.	81.5
Less Shipment China to England	—	7.6
Total China	85.	73.9
Germany:		
Shipments from the United States, Mexico and England	16.7	12.5
Arts and Manufacturers:		
In the United States	33.5	33.5
In England	6.5	6.
Coinage:		
U. S. Mint	6.5	6.7
Mexican Government	—	4.1
Unaccounted for	27.	26.
Total	265.2	254.3

Metal Manufacturing in Europe

Factory methods of manufacture of non-ferrous metals in Europe are advancing steadily, and, were it not for a number of difficulties involving labor, markets, etc., European production might soon become as efficient as that of the United States, David Levinger, Engineer of Manufacture, Western Electric Company, explained this situation to a group of metallurgists, mining engineers and fabricating plant officials who gathered at a meeting of the New York Section of the American Institute of Mining and Metallurgical Engineers, at the rooms of the Machinery Club, New York City, on Thursday evening, January 26, 1928.

Mr. Levinger, who recently spent three months in Europe with a group of engineers from his company, inspected about 75 plants, traveling throughout England and the Continent. Of British manufacture, he said, there is little to say. Very few of the brass or copper fabricating plants there are modern, but a few are as well or better equipped as any abroad. Machine design is making the most important strides in Germany, where constant improvement and research are being carried on. The progressiveness of the German manufacturers of machinery, the excellence of the mechanical products of Switzerland, the immense improvement in Italian industrial affairs, Mr. Levinger declared, were the outstanding features of the European scene as he saw it last summer.

A number of European plants which he visited have been experimenting with the hot rolling of brass. This, Mr. Levinger considers, is a genuine effort to advance the practice of brass fabrication, and should be closely checked by American producers desiring to adopt the best production methods.

In wire drawing, according to Mr. Levinger, most of the European plants are by no means as well equipped or as efficient as the American producers. The lack of labor-saving machinery is a most prominent factor in this difference. Where the American wire drawers are only too anxious to install repeaters on their machinery, the Europeans are content to have this done by the less efficient hand method.

Mr. Levinger stressed the fact that the management, more than the labor, in European industry, is to blame for the poor industrial conditions. He believes that were the management to adopt a policy of high efficiency, install the most modern labor-saving devices, produce quality products in quantity, there would be an improvement in the general welfare, as well as in industry. He believes that an increase in the consumption of all products would result from increased productivity of the working classes.

Standardization of Aluminum Utensils

A recent meeting in Berlin, Germany, of representatives of the German Aluminum Ware Industry Association and the British Aluminum Hollow-ware Manufacturers' Association, discussed the standardization of aluminum utensils, and the introduction of world-standards. It is understood that the English makers are now to attempt to set up British standards, taking into account as far as possible the German standards. The question of world-standards, which would require the cooperation of the French, Swiss and American industries, has been postponed.—MONTHLY NEWS BULLETIN OF COMMERCIAL STANDARDS GROUP, BUREAU OF STANDARDS.

The Metal Industry

With Which Are Incorporated
THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER
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EDITORIAL

Why Foundries Lose Money

There are about 250,000 corporations in the United States. On paper, at least, 80 per cent of these corporations operate at a loss. These figures, presented by E. T. Runge, consulting cost specialist of the National Founders Association, at a recent meeting of that Association, are a little too startling to be taken literally. However, even after making the necessary corrections for tax returns which are so calculated as to absorb all profits in the salaries of the officials and owners, there must still remain a very large number which do not show profits. Mr. Runge, confining himself to the foundry industry, attributed this condition to the following reasons:

1. Many foundries, instead of selling their castings f.o.b., allow the freight to customers' plants.
2. Foundries pay their customers a 2 per cent discount for payment in 10 days, which nets the purchaser a return of 36 per cent per annum on his money.
3. Many customers return castings, the average rejections running about 3 per cent. They may return them for good reasons, but they may also return them for reasons which have nothing to do with the correctness of the castings according to specifications.
4. Many foundrymen do not know how to figure labor properly, calculating the output per day on the basis of the fastest man or the fastest run, rather than the average.
5. About 90 per cent of foundrymen do not figure their costs accurately or estimate them at an average cost per pound. They do not use a practical departmental division in their plant.
6. Core costs are not properly calculated.
7. Many foundries are under the delusion that it pays to sell a part of their capacity below cost in order to increase tonnage and decrease overhead.

The first reason is clearly a fatal omission, as only a foundryman who keeps his records in his head can overlook freight bills when they come in.

Reason 2 may have some bearing, but the custom of business in this country is such that it would be a practical impossibility to wipe out the 2 per cent discount. To be sure, on paper it does show a net return of 36 per cent, but everyone knows that this is altogether theoretical and that not even a bank can make its money continue to work at that rate.

Reason 3 is up to the individual foundry to correct. Castings returned unfairly with claims for credit and are nothing more or less than an evidence of dishonesty.

Reasons 4, 5 and 6 can be summed up in a short phrase, namely, that most foundrymen do not know how to figure their costs. The last reason is also related to this category but includes the additional element of a weak backbone.

By and large, the really important reasons for unprofitable operations by foundries can be summed up in two main headings:

1. Insufficient business.
2. Unprofitable business.

If there are too many foundries in the United States the weak sisters will be crowded out. There is undoubtedly enough business for all the sound and capably managed foundries in existence. The most important point is that foundrymen should have the intelligence and strength of character to refuse business which will lose money. First be sure that costs are accurate; then refuse to accept business at prices below those costs. If these principles were universally adhered to, there would be no more talk of unprofitable foundries.

Chromium Plating and the Public

A startling change has occurred among manufacturers and even the general public with regard to metal finishing processes. Every manufacturer of plated and polished metal products and a growing portion of the consuming public is now aware of the existence of electroplating and finishing processes.

What has awakened them to the existence of this all important side of their business? It is a combination of chromium plating and publicity.

Years ago engineers noted the terrific ravages of corrosion. Executives and the consuming public gradually awakened to the same fact when figures were laid before them showing the losses in black and white. Then the slogan "Save the Surface and You Save All" was adopted by the paint and varnish manufacturers, and it dawned upon manufacturers in general that a beautiful exterior not only attracts customers but that a permanent exterior brings back these customers because of the durability of the product. Efforts were intensified to improve metal finishes in every possible way, and the latest and most striking improvement is chromium plating.

For a varety of reasons chromium plating received wide publicity almost at once. Trade publicity carried it far but now the general public is aware of it and is demanding it. As a result, the manufacturer asks his superintendent about the sort of plating department they have. "Can we do chromium plating? Why not? What sort of a man is the foreman plater? Does he know his business? Can't he do chromium plating? Why do we need new equipment? Why are the rejections so high? Do we or do we not need a chemist to work with the plater." These and a host of other questions have opened up the subject of the plating room until it has assumed an importance which it never had before.

Chromium plating, still a delicate operation and, in many cases, highly experimental, has put every plating department and its foreman to the test. The effect of this situation on the foreman will depend entirely upon him-

self. If he is a good man he will rise to the emergency. He may even enlist the aid of the chemist. The important thing is not how much help there is, but how low the costs can be brought and how well the product can be made.

We venture also to express the strong belief that it is a fortunate thing for the electroplater (and perhaps for the plating indusry in general) that the American Electroplaters' Society had been in existence for a number of years when chromium plating appeared. The Society has educated its members, given them an understanding of systematic control and solution analysis, and warned them of the dangers of rule-of-thumb methods.

Chromium plating is no rule-of-thumb operation. We believe that the advent of chromium plating is one of the best things that ever happened to the metal finishing industry.

Platers' Research Fund

A financial report, as of November 1st, 1927, of the research Fund of the American Electroplaters' Society shows total receipts of about $6,500 and total expenditures of about $1,400, leaving a balance of about $5,000. It is known of course that W. P. Barrows, the Research Fellow at the Bureau of Standards, is at work on the problem of spotting out, a preliminary report of which has already been made. (See THE METAL INDUSTRY, December, 1927, pages 498-499.) Other problems are contemplated but cannot be attempted at this time because the funds in hand do not warrant it. The sum originally set out for was $10,000, and until this amount is subscribed it is not likely that all of the work planned will be undertaken.

We again urge our readers to subscribe to this fund. The value of the work can be described in a word. If the research on spotting out results in even partial control of this destructive phenomenon, savings will be effected which may very easily run up into hundreds and thousands of dollars annually.

It is noteworthy that the local branches of the Platers' Society are subscribing. If they can afford to do so, certainly no manufacturer of electroplated products should hold back.

Copper in 1927

The copper industry seems to be in a very steady position. The outstanding features in 1927, according to the United States Bureau of Mines, were even production, a decrease in imports and an increase in exports, a decrease in total stocks, and a falling off in domestic consumption. While this, in a general way, seems to be a rather mixed situation, the deductions can only be made by comparing the amounts of the increases and decreases noted. The fact that these were on the whole favorable to the industry is proved by the comparatively sharp rise in the price of refined copper during the latter part of the year. Indications are that exports increased about 10 per cent in 1927 over 1926 and this alone accounts for about 100,000,000 pounds. Smelter and refinery stocks showed indications of a decrease of about 50,000,000 pounds. On the other hand, domestic consumption was about 128,000,000 pounds less than in 1926.

Future consumption is, of course, impossible to estimate. The needs of the United States have grown from year to year, but a recession in 1927 was not unexpected because of the holding off in the demand for automobiles and new building. If the automobile trade comes back in 1928 and if building does not fall off too sharply, the coming year may easily be one of the banner periods of the copper industry.

Moving Pictures by Radio

Published statements from the large manufacturers of radio and electrical apparatus tell us that radio television recently had its first practical demonstration, arranged by the Radio Corporation of America and the General Electric Company. Television home sets were placed at three different points and a group of engineers, scientists and newspaper men saw the moving images and heard the voices of a man and woman, transmitted from the Research Laboratories of the General Electric Company, several miles away.

According to David Sarnoff, vice-president of the Radio Corporation, there are still many experimental stages to be passed before a practical television service can be established. The television apparatus is intended to supplement and not to replace the present day radio receiving set.

The elements in the construction of the television receiver are a light source, a scanning device and a synchronizing system. The amplifier is similar to the amplifier of the common loud speaker. The receiving system substitutes a neon gas filled lamp for the loud speaker. Amplified current is delivered to this (the Moore lamp), which varies with the variation in intensity of the current and gives fluctuations of the light intensity.

The published details of this instrument do not as yet describe the metals used, but undoubtedly non-ferrous metals will form an important part of their construction. It seems that the television receiver should add a not inconsiderable outlet for metals and alloys.

GOVERNMENT PUBLICATIONS

Market Research Agencies. A guide to publications and activities relating to industrial marketing; 1927 edition. Department of Commerce, Washington, D. C. Price, 15c.

* * *

The following pamphlets have been issued by the Bureau of Mines in Washington, D. C.

Clay in 1926. Price 5c.
Gypsum in 1926. Price 5c.
Manganese and manganiferous Ores in 1926. Price 10c.
Gold and silver in 1925. (General Report.) Price 10c.
Asbestos in 1926. Price 5c.
Lime in 1926. Price 5c.
Silica in 1926. Price 5c.
Mercury in 1926. Price 5c.
Magnesium and its Compounds in 1926. Price 5c.
Zinc in 1926. Price 5c.
Abrasive Materials in 1926. Price 5c.

SHOP PROBLEMS

THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

CHROMIUM PLATING

Q.—In your September, 1927, issue you mention a commercial plating solution for chromium. This was in the answer to problem 3681. Will you please send me the method of making this solution?

A.—The procedure in preparing the solution is as follows: Dissolve the chromic acid and chromate of iron in ⅓ the total amount of water, heated to 180-200° F. Stir the solution thoroughly and maintain the temperature until nearly all the iron chromate goes into solution. In as little boiling water as possible dissolve the chromic sulphate and mix thoroughly in the solution first prepared. Then add the balance of the water. A revised formula is as follows:

Water	1 gallon
Chromic acid	50 ozs.
Chromate of iron No. 348	2 ozs.
Chromic sulphate	1 oz.

Temperature 115°-130° F., voltage 6 to 9; amperage 50 to 150 per sq. ft. of surface area; lead anodes, ¼ x 4 x length as desired. —C. H. P. Problem 3,721.

HOT LEAD DIP FOR BRASS

Q.—Is there any process for coating brass castings with lead in a manner similar to that in which tinning is done?

A.—Brass castings can be coated with lead in the following manner:

1. Castings should be clean and free from sand, and preferably bright acid dipped.
2. From the bright acid dip the castings should be immersed in a mercury dip solution prepared as follows:

Water	1 gallon
Mercuric chloride	4 ozs.
Nitric acid	⅛ oz.

3. After the mercury dip, rinse in a strong sal ammoniac solution prepared thus:

Water	1 gallon
White sal ammoniac	2 lbs.

4. Drain well and immerse in a molten lead bath. After the castings are uniformly coated with lead, quench them quickly in water heated to 180° F., to which is added 8 ozs. of sal ammoniac per gallon. This solution will help to produce a smooth, even coat of lead. Please let us know the results you obtain.—C. H. P. Problem 3,722.

LEAD PLATE ON BRASS

Q.—Can you give us any information about the plating of pure lead on brass castings? Have you any bulletins on this subject and do you happen to know of anyone in the Buffalo district who would be in a position to handle this type of work?

A.—Plating pure lead on brass castings is not a difficult operation. The usual methods of electro-plating must be strictly adhered to insofar as having a clean surface on the article is concerned. It might also be advisable to coat the brass with a thin coat of mercury from a mercury cyanide dip previous to lead plating.

Mercury cyanide dip:

Water	1 gallon
Sodium cyanide, 96-98%	6 ozs.
Red oxide of mercury	⅓ oz.

After cleansing, the brass articles should be immersed in the mercury dip for a moment, which should result in a slight whitening of the brass due to the mercury deposited. The articles should then be thoroughly washed then lead plated directly. One of the best solutions for heavy lead deposits is the fluosilicate lead solution that is obtained as a by-product of lead refining. This can be purchased from the U. S. Lead and Refining Company, East Chicago, Ind.

For regular still solution plating the solution as received can be reduced in volume with equal parts of water. To each gallon of solution so prepared add 1 oz. New Orleans black molasses. Anodes should be of pure sheet lead not less than ¼-in. thick. Voltage, 3 to 4 or as may be found advisable.

On page 12 of Platers' Wrinkles will be found two solutions that can be used for this work.

Many firms operate the alkaline lead solution and plate directly upon the surface of any metal if a heavy deposit of lead is not required. Otherwise, the acid type of solution, usually operated at 70 to 80° F., should be used.

Electro-plating firms in Buffalo should be able to do this work.—C. H. P. Problem 3,723.

MATTE DIP FOR BRASS

Q.—What is a matte dip for yellow or red brass spun articles and also castings, which will give the appearance of a satin finish? I have tried the following formula but the result was too much lustre:

Nitric acid, 36°	200 parts
Sulphuric acid	100 parts
Common salt	1 part
Sulphate of zinc	1–5 parts

This mixture is used cold, as I have no means of heating it.

A.—Your formula for a matte dip will not give you the desired finish. It will result in too much lustre, as you have found. The following formula will give you the desired results:

Take sufficient nitric acid, 36°, to immerse the articles completely. To the nitric acid, add slowly, commercial oxide of zinc, stirring constantly, until the consistency of heavy whitewash is reached. Be careful to add the zinc oxide very slowly. Place the receptacle in hot water and test the solution. If the matte is too coarse, add small amounts of sulphuric acid until the right degree of matte finish results. The minimum amount of sulphuric acid is 1 to 2 ozs. per gallon of nitric acid and zinc. After matte dipping the articles, they should be washed in cold water, then very quickly bright acid dipped to bring up a lustre to the matte finish. The satin finish dip must be stirred thoroughly before each immersion of articles so that the zinc does not settle out.—C. H. P. Problem 3,724.

MOTTLED BLUE ON STEEL

Q.—We wish to put a mottled blue finish on steel wrenches such as the enclosed sample. The color is generally known as mottled blue and is seen on gun parts and other steel articles. We have tried to get this finish in a rotary carbonizing furnace, but our results have been unsatisfactory. Can you suggest hardening methods, or treatment after hardening, that will give us a blued finish?

A.—We do not believe that you can obtain the mottled blue you desire by use of a rotary carbonizing furnace. It may be possible to obtain it by the aid of leather charcoal as the carbonizing agent. This data is given in Bullins' "Heat Treatment of Steel." However, the method most generally in use for the production of a mottled blue finish on steel wrenches, gun parts, etc., is as follows:

Cleanse and brighten the steel articles as much as possible and immerse in a molten cyanide case-hardening bath heated to 1250-1300° F., or a cherry red. A 28-30 per cent or a 45 per cent cyanide mixture is satisfactory. As soon as the parts are heated to the necessary temperature in the cyanide bath, they should be removed, held in the air for a moment, then plunged into cold water which is being slightly agitated by air through a coil in the bottom of the cold water receptacle. The coil may

be of steel, with holes drilled in at intervals to allow the air to pass through and create a fairly good bubbling of the water.

The addition of an ounce or less of sodium nitrate per gallon of water produces a more intense mottled blue. After mottling and drying, the steel parts should be tumbled in sawdust for a few moments. The sawdust should be slightly moistened with any type of oil. While the tumbling is not indispensable, the product gains a better appearance by the oil treatment.—C. H. P. Problem 3,725.

POLISHING ALUMINUM

Q.—We are manufacturing aluminum tubes and have had some difficulty getting the shoulders with a bright polish. It may be necessary for us to buff these. Can you suggest to us please, the names of one or two manufacturers of buffing wheels, brushes or machinery? From your past experience have you any information at all as to what chemical or material could be used in buffing them?

A.—It might be possible to ball burnish the aluminum caps with steel balls. We suggest that you submit a quantity to some of the advertising ball burnishing barrels in THE METAL INDUSTRY.

The polishing medium to be used with ball burnishing should be:

Hot water	1 pint
Neutral soap chips	1 oz.
Kerosene oil	1 oz.

Mix thoroughly, then add to 7 pints cold water. Balls should be of sufficient diameter so they will not go in the cap. The buffing medium should be Vienna lime composition. A very small amount of kerosene oil should be applied to the buff wheel with a brush. The caps will then be bright and clean. You should obtain an experienced man to do the polishing if it must be done; a man who has had experience in polishing aluminum and nickel plated zinc toilet bottle caps.—C. H. P. Problem 3,726.

RED BRASS ACID DIP

Q.—Will you kindly send me a formula for a red brass acid dip and also suggest a good nickel solution for the same? Is there an acid dip for polished brass which eliminates the necessity of scouring before plating?

A.—The only acid dip that we know of which can be advantageously used in removing the oxide from polished red brass surfaces is a dilute solution of muriatic acid and water, in these proportions:

Water	1 gallon
Muriatic acid	8 ozs.

Some platers use this instead of a cyanide dip. It should not be necessary to scour your product before plating if it is properly cleansed. Try the following cleaner:

Water	1 gallon
Trisodium phosphate	2 ozs.
Soda ash, 58%	½ oz.
Caustic potash	½ oz.
Sodium cyanide	½ oz.

Temperature, 200 deg. Fahr.

This solution should eliminate the necessity of scouring or use of an acid dip.

A nickel solution that is perhaps best adapted to your product can be prepared as follows:

Water	1 gallon
Double nickel salts	8 ozs.
Single nickel salts	4 ozs.
Boracic acid	1½ ozs.

Dissolve all the salts together in one-half of the water, at boiling temperature, then add the balance of water cold.—C. H. P. Problem 3,727.

THICKNESSES OF COPPER DEPOSITS

Q.—Will you kindly inform me of the thickness of the heaviest deposit of copper of which you know? It may be either on steel or in electrotype.

A.—We have seen a one-half inch deposit of copper put on steel by the use of a copper cyanide solution containing not less than three and one-half ounces of metal, or the equivalent of five ounces of copper cyanide. The following formula would equal those proportions:

Water	1 gallon
Sodium cyanide, 96-98%	5½ ozs.
Copper cyanide	5 ozs.
Sodium bisulphite	1½ ozs.
Caustic potash	½ oz.

Solution should be used at a temperature of 120° to 140° F. Voltage, 4 to 5; amperage, 25 per square foot. This solution would have to be air agitated, with the air deflected directly towards the anodes, which would keep them clean due to the constant change of the solution at the anodes. We have given the minimum amount of sodium cyanide for the solution, and constant additions would have to be made to the solution in order to maintain anode reduction; one-eighth ounce per gallon of solution should be added at each time.

Acid copper solutions will produce copper deposits of equal thickness. Such a solution would require agitation in a similar manner and possibly would need to be continuously filtered. The solution should be prepared as follows:

Water	1 gallon
Copper sulphate	28 ozs.
Sulphuric acid, 66°	4 ozs. (Minimum)
Yellow dextrine	1/10 oz.

This solution should be used at normal temperature. Voltage, 1 to 2. Amperage, 25 per square foot.—C. H. P. Problem 3,728.

TIN PLATING

Q.—Will you please give me a formula for electro-tin plating. I have to tin plate a small article which must have a very nice white lustre finish? I have never done tin plating. I made a sample but it is dark and smoky. I made a solution of caustic soda; sodium cyanide and tin chloride. Will you please give me all details?

A.—The following formula will give you a good heavy white deposit of tin on brass or steel, either in still or mechanical plating:

Water	1 gallon
Sodium stannate	12 ozs.
Caustic potash	2 ozs.
Borax powder	2 ozs.

Anodes, pure Straits tin, or insoluble anodes of sheet steel may be used with some tin anodes; voltage, 3 to 4; mechanical, 5 to 6; temperature 160°-180° F. The tin deposit obtained from this solution is an opaque white. To produce a bright lustre, scratch-brush the surface of the tin plated articles, dry with soft crimped steel wire scratch brushes which must be kept clean. Small articles can be tumbled bright by the aid of a mixture of equal parts of wheat bran and fine maplewood sawdust. As a burnishing or polishing medium, mix with the bran and sawdust about 1 or 2 ozs. precipitated carbonate of lime or Vienna lime.—C. H. P. Problem 3,729.

UNEVEN BRONZE PLATE

Q.—Will you tell me how to rectify my bronze solution which is made up of copper, zinc and cyanide potassium? When the solution is not in use the anodes (bronze) gather a white or gray coating on them. This coating disappears whenever the solution is working a little time. The articles being plated come out a nice color near the top of solution but articles nearer the bottom of bath come out very much lighter—in fact brass color. I have to use very little current or else articles both top and bottom of solution come up yellow. This means that there is not much of a coat on the articles being plated.

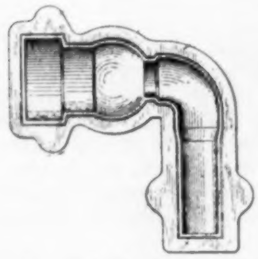
A.—The gray white deposit upon your bronze anodes would indicate that the material is zinc cyanide. An excess of sodium cyanide would not help to keep the anodes clean. What is required is a small amount of caustic potash that will help to hold the zinc cyanide in solution. When you overcome the separation of the zinc cyanide, then your bronze anodes will stay clean. We would suggest that you add to the solution the following materials per gallon:

1. Bisulphite of soda .... 1 oz.
2. Sodium cyanide .... 1 oz.
3. Caustic potash .... ¼ to ½ oz.

Add the ¼-oz. of caustic potash first, then wait for an interval of several hours; if necessary add the balance. Occasionally add ⅛-oz. caustic potash per gallon to the bronze solution to keep the anodes free from zinc cyanide.—C. H. P. Problem 3,730.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST



1,649,312. November 15, 1927. **Electrolytic Core Box.** Arthur K. Laukel, Detroit, Mich.

A core box formed from electrolytically deposited metal reinforced by a cast metal structure.

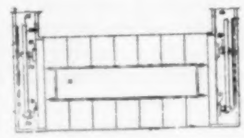
1,649,628. November 15, 1927. **Method of Manufacturing Fluxed Solder in Wire Form.** Thomas E. Wales, San Francisco, Calif.

A method of manufacturing fluxed solder in wire form, which consists in forming a series of closely interspaced pockets in one side of the wire throughout its length, filling the pockets with a fluxing material and crimping the other edges of the pockets together to seal the pockets.

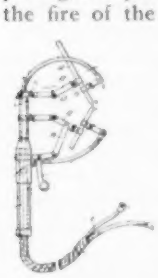
1,649,786. November 15, 1927. **Process for the Recovery of Platinum.** Duncan C. Smith, Rockaway, N. J.

The process of recovering platinum from a heterogeneous mass which includes dissolving the mass in water, adding ingredients which will react to evolve hydrogen and form a salt, removing the platinum thrown down by the reaction and purifying the same.

1,649,824. November 22, 1927. **Galvanizing Furnace.** Harry E. Gilbert, Bridgeport, Conn., assignor to Harry E. Gilbert & Son, Bridgeport, Conn.



A furnace containing a kettle, a fire alongside of the kettle comprising a heating chamber, a combustion chamber forward of the heating chamber, and a heating agent, a perforated wall of siliceous material between the heating chamber and the kettle, a flue forward of the fire, and passages adjacent/the kettle for the travel of heat gases from the fire of the flue.



1,650,431. November 22, 1927. **Electric Torch for Welding, Brazing and Cutting.** George Walter Crandall, Plattsmouth, Nebr.

A portable electric torch comprising a handle, electrode holders insulatingly supported thereon, electrodes carried thereby, electricity conductors passing through the handle and extended laterally thereof and disposed in opposed relation to constitute terminal clamp supports, and terminal clamps carried thereby and engaged with the electrodes.

1,649,803. November 29, 1927. **Low-Viscosity Lacquer and Film Produced Therefrom.** Edmund M. Flaherty, Parlin, N. J., assignor to E. I. du Pont de Nemours & Company, Wilmington, Del.

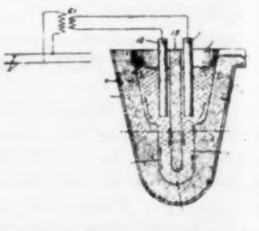
An article covered with a hard, durable, tough, non-shrinking and adhesive film formed from a composition comprising a cellulose nitrate having a viscosity characteristic such that at above 20 per cent concentration in mixed solvent of the composition hereinbefore described it will provide a solution below 25000 centipoises in viscosity, and comprising also a resin.

1,650,631. November 29, 1927. **Process of Preparing Metals with High-Temperature Fusing Points Such as Tungsten and of Preparing the Wire Therefrom.** Fritz Koref, Charlottenburg, and Hans Alterthum, Halensee, near Berlin, Germany, assignors to General Electric Company, a Corporation of New York.

The method of making tungsten wire which consists in first making a large brittle tungsten crystal and then working this crystal into a flexible and ductile state.

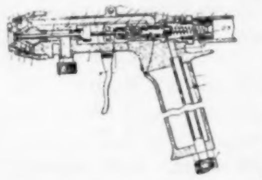
The method of making tungsten wire which consists in compressing powdered tungsten, sintering it into a large crystal in an atmosphere of reducing gas, and thereafter working the crystal while still hot into a flexible and ductile state.

1,650,675. November 29, 1927. **Electric Furnace.** James M. Weed, Scotia, N. Y., assignor to General Electric Company, a Corporation of New York.



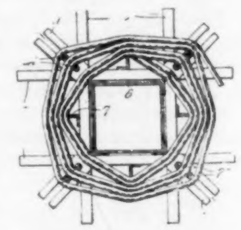
An electric furnace comprising a crucible providing a reservoir for the charge divided into a plurality of separate portions connected together at their bottoms through a duct having contiguous legs lying in parallel planes, and means for passing an electric heating current through the portion of the charge in said duct.

1,650,686. November 29, 1927. **Spray Gun.** Harry D. Binks, Oak Park, Ill., assignor to Binks Spray Equipment Company, Chicago, Ill.



In a spraying appliance, a nozzle, a body member supporting the nozzle and having a bore therein and an air duct leading from the bore to the nozzle, a tubular valve body mounted in the said bore and having a port connecting the bore of the valve body with the said duct, air supply means connected to the bore of the valve body, and a control member slidably mounted in the bore of the valve body for controlling the passage of air from the said bore to the said port, the control member having a plurality of apertures of different areas respectively adapted to align with the said port according to the position of the control member.

1,650,730. November 29, 1927. **Method for Metal Coating Wire and the Like.** Edward L. Watrous, deceased, El Paso, Tex., by Agnes B. Watrous, executrix, Evanston, Ill.



The method of coating metal wire comprising applying a coating of molten metal to the wire and then subjecting said wire to the action of centrifugal force before the coating metal congeals, said steps being carried out while convolutions of the wire are positively maintained out of contact with other convolutions by means of interposed spacers, so that superfluous coating metal may be freely cast off and adherence of the convolutions prevented when the coating congeals.

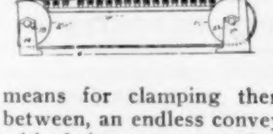
1,650,899. November 29, 1927. **Composition for Use in the Manufacture of or for Use as Varnishes and the Like and Method of Making the Same.** Howard W. Matheson, Montreal, Quebec, Canada, assignor to Canadian Electric Products Company, Limited, Montreal, Quebec, Canada.

A composition of matter capable of use as a varnish, cement or the like comprising a fusible and soluble-acetylene-phenol resinous body capable of being rendered infusible and insoluble, a hardening agent, and a solvent.

1,651,130. November 29, 1927. **Compound for Removing Paint and Stains.** John W. Jones, Philadelphia, Pa.

A paint and stain removing solution consisting of equal parts by volume of liquid soap, denatured alcohol, chloroform, aqua ammonia, turpentine, and gasoline.

1,651,197. November 29, 1927. **Apparatus for Finishing Metal Ware.** Andrew L. Fabens, Wooster, Ohio, assignor to The Buckeye Aluminum Company, Wooster, Ohio.



In apparatus of the class described, the combination of a plurality of fixtures each adapted to carry a hollow article with a mass of balls therein, said fixtures comprising circular plates and means for clamping them together with the article therebetween, an endless conveyor on which said fixtures are carried with their axes arranged transversely of the direction of movement of the conveyor so as to be adapted to roll thereon.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

IMMERSION HEATER FOR ELECTROPLATING SOLUTIONS

An electric immersion heater for electroplating solutions and other liquids which will not attack lead has now been developed by the General Electric Company, Schnectady, N. Y. It is primarily intended for low-temperature heating only.

The unit consists of a steel-sheathed helicoil unit covered with a lead jacket swaged tight to the steel unit. The terminals are brought into a terminal box suitable for conduit connections. It is made in two sizes, both for a maximum demand of five kilowatts, one for 110-volt circuits and the other for 220-volts.

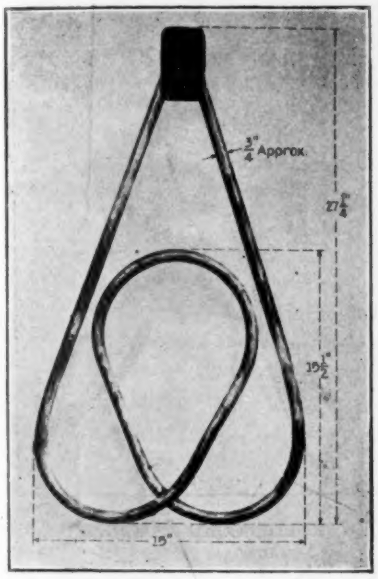


FIG. 1—LEAD SHEATHED HEAT UNIT

Only the lower portion of the heaters dissipates heat. The upper portion, being inactive, allows the unit to be used in tanks in which the level of the solution may be as low as ten inches from the top of the tank.

Among the advantages claimed for this unit are its ease of installation, its portability, the lack of interference with work in the tank and the minimum maintenance expense. The heater can be supplied in different formations.

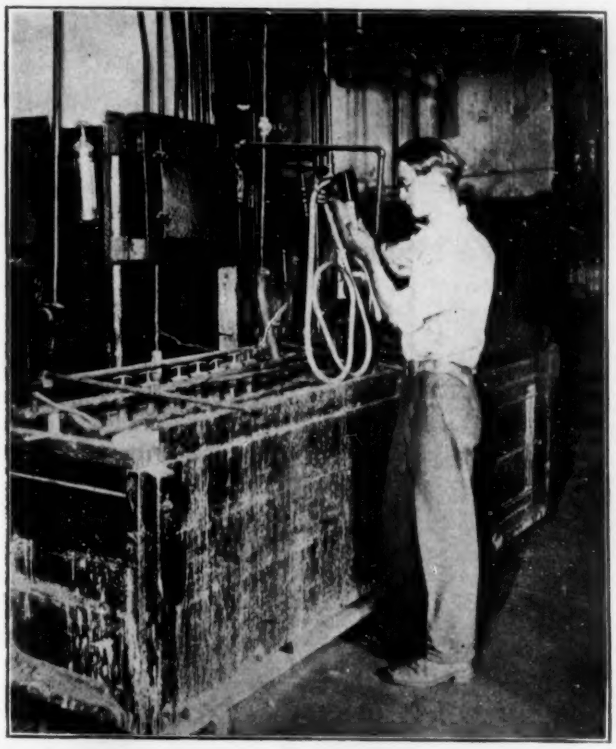


FIG. 2—PORTABLE IMMERSION HEATER FOR NICKEL TANK

NEW CONVERTER FOR HIGH FREQUENCY INDUCTION FURNACES

The design of the 3 Kv-a converter was a direct result of the numerous inquiries for a small Ajax Northrup high frequency furnace capable of melting metals in small qantities. This small furnace equipment is essentially the same design as the larger 15 and 35 Kv-a converters. Several new features have been embodied, however, which have simplified the construction.

The transformer is fitted with a tapped reactance and connections are brought out from this reactance to the front panel. Reactance steps corresponding to 10 per cent variation can be effected and consequently it is possible to determine by experiment the best reactance to use with any particular set up.

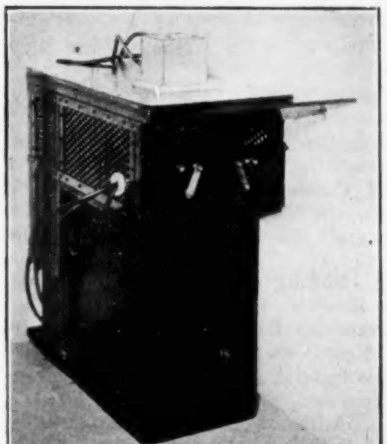
The condensers which are of standard type are mounted behind the transformer. Only two units are used and these are connected in parallel.

The spark gap embodies several new features. Because of the small amount of power handled it has been found possible to simplify the construction of the gap considerably. The gap is so designed that the interior is easily laid open to inspection by the removal of three wing nuts. The electrode is water cooled and of generous dimensions. The spark gap is located on a small table at the level of the transformer top and immediately over the condensers. Control of power is effected by raising or lowering the electrode. The furnace when melting is usually placed on the top of the converter which forms a table.

The rugged construction, excellent cooling, and wide safety margin allowed make it possible to operate the converter at considerable overload for short periods.

Up to the present excellent results have been obtained. Temperatures over 2,700 degrees C have been observed in a graphite crucible 3 inches deep ½ inch inside diameter in ten minutes. Solid cylinders of Acheson graphite 2½ inches in diameter, 2¾ inches long have been heated to 1,900 degrees C in 25 minutes. Pure Armco iron has been melted at a rate of 10 minutes for a charge weighing 9 ozs. while pure electrolytic nickle melted at a rate of 9 ozs. in 9 minutes. Both the iron and nickle were melted free from any carbon or other contamination. It is possible to reproduce on a small scale almost all results obtainable with a 15 or 35 Kv-a equipment.

The converter can be mounted on a truck and moved from one location to an other so that melting can be carried on anywhere where there is a suitable source of electricity. This feature should appeal to colleges since the furnace equipment can be moved from room to room for demonstration. The equipment is admirably suited for dental and jewelers work.

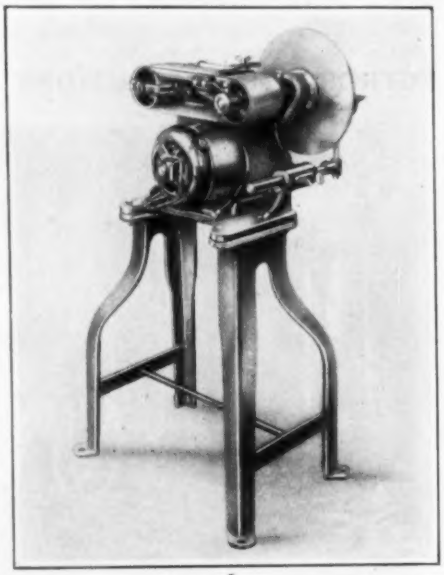


3 KV-A CONVERTER

No expense has been spared to make this small high frequency furnace equipment efficient, long lasting and cheap to operate. Replacements will be rare and there is practically nothing to wear out, the upkeep of the equipment is therefore reduced to a minimum.

ABRASIVE-BAND GRINDER

Walls Sales Corporation, New York, is offering a newly developed motor driven abrasive-band grinder, known as the Simplex B-M. The machine is used in straight-grain grinding, and is said to be equally efficacious for rough, smooth or fine finishes. This variety of uses, it is claimed, together with high productive capacity, make the machine especially desirable for metal finishing. It can also be used on composition and wood parts.

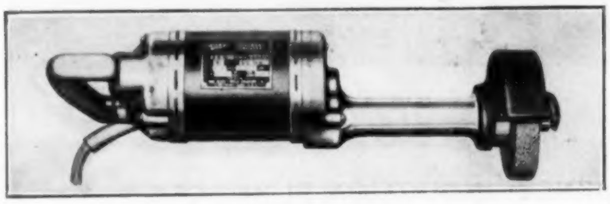


ABRASIVE-BAND GRINDER

The device, shown in the accompanying illustration, has a table measuring 18 x 10 in., over which the abrasive-band operates, and to which special fixtures may be attached. A removable bevel attachment is supplied with the machine. Abrasive bands, it is stated, can be rapidly and easily changed.

PORTABLE GRINDER AND BUFFER

A new ½ h.p. portable grinder and buffer, equipped with ball bearing motor and roller bearing grinding spindle has been designed and produced by The Hisey-Wolf Machine Company, Cincinnati, Ohio. The grinder, which is shown in the accompanying photograph, is equipped with the new Hisey two pole switch, which is controlled at the grip handle. The motor is of the Hisey single purpose type, universal, operating on direct current or single phase alternating current. The cast steel wheel guard can be adjusted to any angle desired, while being easily removable for renewal of wheels.

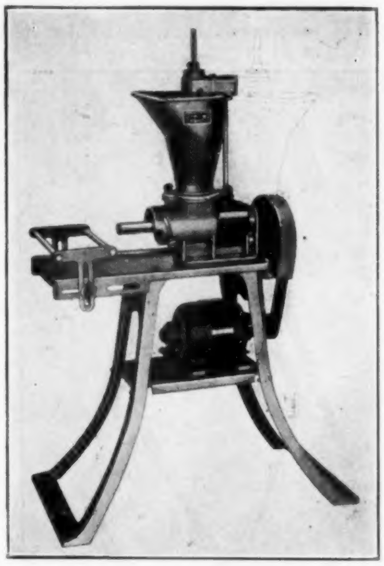


PORTABLE GRINDER AND BUFFER

NEW CORE MACHINE

The American Foundry Equipment Company, Mishawaka, Indiana, announce the new American "Rapid" core making machine, improving and succeeding the "Hammer" machine.

"Hammer" core machines were introduced about 1905 by the Brown Specialty Machinery Company of Chicago. The American company marketed the line since 1919. Realizing the need for a more modern, faster and better machine, this company gave much time and effort to develop and perfect the improved American "Rapid" core machine.



RAPID CORE MACHINE

Special features claimed for this machine are as follows:

Adjustable force feed rod and mixer to insure uniform sand feed for all sizes of cores. Eliminates necessity of hand feeding.

Specially formed hopper lip which makes possible the use of an auxiliary hopper where wanted.

New specially shaped hopper which, with adjustable feed rod, makes it impossible for sand to bridge or collect in pockets. Hopper can be run clean.

Swinging hopper permitting ready access to conveyor chamber. This permits quick cleaning and ready access to working parts.

The Rapid machine may be supplied for either direct motor drive as illustrated, or from power shafting. While the Rapid is essentially a power machine, it can be supplied for hand operation where wanted.

Equipment and Supply Catalogs

Crown Lead Products. Crown Metal Company, Milwaukee, Wis.

Recording Wattmeters. The Bristol Company, Waterbury, Conn.

Tungar Battery Charger. General Electric Company, Schenectady, N. Y.

High Grade Acid Proof Chemical Stoneware. General Ceramics Company, New York.

Torchweld Welding and Cutting Equipment. Torchweld Equipment Company, Chicago, Ill.

Tube and Rod Straighteners. The Torrington Manufacturing Company, Torrington, Conn.

Price List of Polishing, Buffing and Plating Materials. E. Reed Burns & Sons, Brooklyn, N. Y.

Sales Promotion and Refixturing Campaign. Artistic Lighting Equipment Association, New York.

Kellog Compressors for industrial and other uses. Kellogg Manufacturing Company, Rochester, N. Y.

Look for the Diamond. Advance Wheel Manufacturing Company, Inc., Chicago, Ill. Polishing wheels.

Are You in Line with Business Forecast? Chicago Flexible Shaft Company, Chicago, Ill. Stewart Industrial furnaces.

Brown Pyrometer Installations in the Metal Working Industries. The Brown Instrument Company, Philadelphia, Pa.

Resisting Corrosion by Chromium Plating Oil Refining Equipment. Chromium Corporation of America, New York.

Ruemelin Practical Sand Blast Equipment, and Dust Suppression Equipment. Ruemelin Manufacturing Company, Minneapolis, Minn.

The Sulzer System for Dry Quenching of Coke. Dry Quenching Equipment Corporation, subsidiary of International Combustion Engineering Corporation, New York.

Ajax Northrup Electric Furnaces. The Ajax Electrothermic Corporation, Ajax Park, Trenton, N. J. Bulletin 4, on oscillator or spark-gap type converters and furnaces.

Growth of Foremanship Courses in the United States. The Department of Manufacture, Chamber of Commerce of the United States, Washington, D. C. A statistical report covering the period from June, 1926, to June, 1927.

Westinghouse Electrical Supplies, 1928-1930. Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa. A 1200 page book containing this company's complete line of equipment and supplies, illustrated and described.

General Electric Publications: D. & W. Oil Fuse Cutouts, Type D; Low-speed Synchronous Motors; Low-speed Direct-current Generators; Constant-speed Direct-current Motors; Hand Starting Compensators; Type WD-300A Arc Welder; Type GTE Motors for Gearless Traction Elevators; Automatic Supervisory Equipment, Selector Type; CR7006-D26 Magnetic Switch; CR4409 Protective Panels.

ASSOCIATIONS and SOCIETIES

Reviews of the Accomplishments in 1927 and Plans for 1928

INSTITUTE OF METALS DIVISION

HEADQUARTERS, 29 W. 39th STREET, NEW YORK

Many important contributions to non-ferrous metallurgy will be presented at the annual meeting of the Institute of Metals Division in connection with the annual meeting of the American Institute of Mining and Metallurgical Engineers, at its headquarters in New York, 29 West 39th Street. A symposium on secondary metals will be held on the afternoon of February 22, 1928, with E. R. Darby as chairman, and another on precious metals, with George F. Kunz as chairman, will be held on the afternoon of February 23.

The regular technical sessions will begin on Tuesday afternoon, February 21, with R. S. Dean presiding. C. E. Swartz will give the results of a study of the use of alloys of the Pb-Sn-Cd system as solders; L. O. Howard will describe some peculiar results in hardness tests of Pb-Sb alloys; H. J. Miller and M. Lindeman will discuss the use of molybdenum as a resistor in electric furnaces, and Morgan, Swenson, Nix and Roberts will discuss the ternary systems of Pb-Sb with a third constituent.

The morning session on Wednesday, February 22, will be devoted to papers on theoretical metallurgy and metallography, with Zay Jeffries presiding. M. J. Buerger will discuss the cause of translation striae and translation strain-hardening in crystals; R. F. Mehl, the interatomic forces in metals and alloys; Floyd C. Kelley, grain growth in metals caused by diffusion; A. J. Phillips, twinning in copper and brass; and C. H. Mathewson and A. J. Phillips, twinning in magnesium, zinc and cadmium. The symposium on secondary metals will be held in another room at the same time.

At the afternoon session, H. W. Gillett presiding, light alloys will be the general topic; S. H. Anderson and Louis Marick will discuss their radiography, H. B. Pulsiter will describe the etching and structure magnesium, while R. S. Archer and W. L. Fink will describe the aluminum-beryllium alloys. At 4 p. m. the annual Institute of Metals lecture will be given by Prof. C. H. Mathewson of Yale, his topic being, "The Significance of the Twinned Structure in Wrought Iron."

Copper will be the topic of the Thursday (February 23) morning session. F. W. Harris will discuss the distribution of tensile strength in hard drawn copper wire; W. B. Price, C. G. Grant and A. J. Phillips will describe the alpha phase boundary of the Cu-Ni-Sn system; M. G. Corson will discuss the use of manganese; D. J. McAdam, Jr., will talk on corrosion of metals as affected by time and cyclic stress, and P. H. Brace and N. K. Ziegler will describe the application of a high-vacuum induction furnace to the study of gases in metals.

At the symposium on precious metals to which the afternoon of the same day will be given over, F. E. Carter will describe the platinum metals and their alloys; J. O. Whiteley and C. Dietz will give notes on their refining and melting, and Edward Wichers, Raleigh Gilchrist and W. H. Swanger will discuss their purification. The manufacture of sterling silver will be the subject of a paper by R. H. Leach and C. H. Chatfield, while the application of precious metals and their alloys to dentistry will be discussed by R. V. Williams and E. F. Kingsbury will discuss their use as electrical contacts. The session will be concluded by a general discussion of gold-silver-copper alloys conducted by F. E. Carter.

ANNUAL DINNER

The Institute of Metals Division will hold its Annual Dinner at the University Club, 1 West 54th Street, New York City, on Wednesday, February 22, at 6:15 p. m. The regular business meeting will be held at this time, and William H. Bassett will deliver an address on copper and copper alloys.

AMERICAN FOUNDRYMEN'S ASSOCIATION

HEADQUARTERS, 140 SOUTH DEARBORN STREET, CHICAGO, ILL.

CONVENTION COMMITTEES NAMED

Matters in connection with the coming convention of the American Foundrymen's Association were discussed at a meeting on January 13, 1928, at the Union League, Philadelphia, Pa., at which representative manufacturers were the guests of G. H. Clamer, president, Ajax Metal Company. Local committees were appointed and plans for receiving delegates were discussed. The chairman of the Philadelphia committees are:

G. H. Clamer, Ajax Metal Co., general committee; **T. H. Addie,** American Manganese Bronze Co., golf committee; **Ralph Belleville,** Joseph Dixon Crucible Co., ladies entertainment committee; **J. A. Davies,** Westinghouse Electric & Mfg. Co., hotel committee; **Frederick M. Devlin,** Philadelphia Hardware and Malleable Iron Works, entertainment committee; **C. F. Hopkins,** Ajax Metal Co., finance committee; **B. H. Johnson,** Cresson-Morris Co., plant visitation committee; **Walter L. Kalbach,** transportation committee; **Laird U. Park,** Park & Williams, Inc., reception committee; **Earl S. Sparks,** Metal Manufacturers' Association of Philadelphia, publicity committee.

OBERMAYER AWARD CONTEST

The 1928 Obermayer Prize of the American Foundrymen's Association will be given to the person submitting a device, drawing or model of some jig or method, which, in the opinion of the judges, embodies the best ideas for economical production of castings. The entries in this prize contest will be on display at the Philadelphia meeting the week of May 14, 1928. Among the devices which have been prize winners in the past was a fixture for making green sand cores of two fittings in a single box, in 1922, at Rochester. Foundry managers are urged to call this contest to the attention of their shop men and to have them submit entries for the Philadelphia meeting. All who contemplate entering this contest should at once notify the secretary of the A. F. A., 140 S. Dearborn Street, Chicago, Ill.

The sand research work of the association is being continued and during the past year methods of testing sand strength by the compression, tensile and shear test methods were approved as tentative standards. Methods of testing fineness and permeability of foundry sands were advanced to the standard classification. Grading of foundry sands according to grain fineness and clay content has been approved as a tentative standard. The use of synthetic foundry sands to replace natural bonded sands has made great strides and further development is anticipated.

The A. F. A. at its 1927 meeting awarded to Major Robert A. Bull the Joseph S. Seman gold medal for his contributions to the steel casting industry. This award, one of four similar gold medals, is the highest award of the association and is only given to those whose work has been of outstanding character in the foundry industry. The William H. McFadden Medal was awarded to A. E. Outerbridge, Jr.

1928 MEETING

The 1928 meeting of the A. F. A. will be held in Philadelphia the week of May 14 and in connection with this meeting there will be an exhibit of foundry equipment and supplies.

The officers elected for 1927-1928 are:

President, S. W. Utley, Detroit Steel Casting Company, Detroit.

Vice-President, S. W. Johnston, The S. Obermayer Company, Chicago.

C. E. Hoyt was reappointed Executive-Secretary and Manager of Exhibits and,

R. E. Kennedy was reappointed Technical-Secretary.

TESTING MATERIALS SOCIETY

HEADQUARTERS, 1315 SPRUCE STREET, PHILADELPHIA, PA.

DECEMBER 29, 1927.

The year 1927, being one of the years of issue of the Book of Standards, was one in which standardization played a prominent part in the activities of the American Society for Testing Materials. Not only were a number of tentative specifications that had been issued as tentative during the past few years, advanced to standard, but a number of revisions were made in existing standards, and the submission of new tentative standards was given quite a stimulus. This is shown by the six new specifications put out by the Society's Committee B-2 on Non-Ferrous Metals.

In addition to these new specifications, revisions were made in the existing Methods of Chemical Analysis of Aluminum and Light Aluminum Alloys and revisions were approved in six other Standard Specifications. Similarly, the Committee B-1 on Copper Wire advanced a number of tentative revisions to standard.

These zinc-coated materials are also receiving considerable attention in the extensive test programs of this committee. The program of exposure tests of zinc-coated articles announced a year ago is now well under way with material exposed at five locations as follows: Pittsburgh, Pa.; Altoona, Pa.; Pennsylvania State College; Sandy Hook, N. J.; and Key West, Fla.

In connection with these investigations on the corrosion of materials, mention should be made of the painstaking tests being carried out by the Society's Committee B-3 on Corrosion of Non-Ferrous Metals and Alloys, to develop, if possible, a standard test for corrosion resistance. The results of these tests, carried out by a number of co-operating laboratories, employing several types of corrosion tests, are given in this year's report of the committee. A realignment has been effected in the organization of this committee whereby new sub-committees have been organized on Atmospheric Corrosion, on Corrosion in Liquids and on Galvanic and Electrolytic Corrosion.

The study of corrosion has not been confined to formal investigations on the part of standing committees. As in previous years, investigations by individuals were reported upon at the 1927 annual meeting in the form of technical papers. The question of corrosion has been intimately associated with fatigue of metals in papers by R. R. Moore and D. J. McAdam, Jr., entitled respectively "Effect of Corrosion upon the Fatigue Resistance of Thin Duralumin" and "Corrosion-Fatigue of Non-Ferrous Metals." The paper by R. R. Moore described a method for obtaining accurate fatigue tests on thin stock. In direct contrast to tensile strength results, the fatigue tests, in which corrosion was accelerated by the salt-spray method, showed a reduction in endurance limit, due to corrosion, of 35 per cent. The paper by McAdam discusses corrosion-fatigue of nickel-copper alloys and aluminum and aluminum alloys.

A number of refinements in the testing of materials have been brought out during the year. A particularly valuable test described before the Society is a modification of the ferroxyl test, presented by Karl Pitschner in a paper entitled "A Rapid and Practical Method of Applying the Ferroxyl Test to Protective Coatings."* Tests for thin sheet metals are mentioned above in connection with the new specifications for rolled zinc. A paper by H. N. Van Deusen, L. I. Shaw and C. H. Davis entitled "Physical Properties and Methods of Test for Sheet Brass," gives the results of a very extensive investigation on the testing of thin sheet metals with particular reference to the hardness test. In connection with the testing of metals, mention should be made of a paper by J. Hammond Smith entitled "Rate of Elongation in Tension Tests" which describes a very ingenious device for use in determining the elastic limit of metals.

Of outstanding importance in the field of non-destructive tests is the test by means of the X-ray. It is comparatively recently that the X-ray was first employed in the testing of metallic coatings. It would appear that the X-ray has a myriad of uses in the testing of materials ranging from the metals to the textiles, rubber and timber. The various uses of the X-ray in industry were admirably presented in a lecture at the 1927 annual meeting of the Society by Dr. George L. Clark, who was the Edgar Marburg Lecturer for 1927.

A very interesting instrument, and one which will probably prove of much importance in the analysis of materials, is the spectograph, described in the paper by F. A. Hull and G. J. Steele entitled "Some Useful Applications of a Quartz Spectrograph."

The field of light non-ferrous alloys seems to be a promising one with a number of new alloys developed during the past few years. The data on corrosion-resistant alloys developed several years ago might also be amplified and brought up-to-date.

The Society has continued to prosper during the past year, its membership and other activities having shown a healthy growth. To place it in a more substantial position in order to attack the many problems before it, increased financial support has been assured through an increase in dues of company members. Its investigations are being well supported by industry. Due to the increase in the number of standards and in the amount of data which the Society is asked to publish, its publication activities have correspondingly increased. During the past year the triennial Book of A. S. T. M. Standards was published in two parts, Part I on Metals (871 pages containing 147 specifications, methods and definitions relating to metallic materials) and Part II, Non-Metals (1,000 pages containing 196 standards, methods and definitions relating to non-metallic materials). The Book of Tentative Standards appeared in October, a book of 824 pages containing 175 tentative specifications and methods of test. The Proceedings will comprise two volumes, aggregating 1,700 pages. These are now in press and contain the various technical papers presented at the 1927 annual meeting, together with committee reports and tentative standards submitted or revised at the meeting.

C. L. WARWICK

* Reprinted in THE METAL INDUSTRY for August, 1927, page 336.

AMERICAN ELECTROPLATERS' SOCIETY

HEADQUARTERS, CARE OF W. S. BARROWS, 628 DOVERCOURT ROAD, TORONTO, CANADA

The Convention Committee in charge of the Convention to be held at the King Edward Hotel, Toronto, Canada, June 25 to 28, 1928, inclusive, wishes to add to previous announcements the following:

Speakers or those presenting papers which will require illustration by steropticon or motion pictures are requested to advise the committee as soon as possible, in order to have such papers placed on the program for Monday evening, June 25, the only evening session.

It is the belief of the committee that the Toronto convention should be particularly attractive to the ladies. The city has many features of interest to them. There are unique French and English shops in Toronto; the city is itself beautiful and filled with interesting places, and the beauty of Canada in summer is well known.

The members will be welcomed by Mayor Samuel McBride at 10 a. m. on Monday, June 25. This will be the only morning session or event at which the ladies will be expected to appear. All other events for ladies are scheduled for afternoons and evenings.

The arrangement of rooms for the convention has been decided upon. All indoor features, with possibly one exception, will take place on the mezzanine floor of the hotel. Exhibits of supplies will occupy a large room immediately opposite the Pompeian Room in which the educational sessions will be held. Registration and information booths will be placed in the corridors. Committee rooms will adjoin the exhibit room.

W. S. BARROWS, Secretary.

NEW YORK BRANCH

HEADQUARTERS, CARE OF R. J. LIGUORI, 127 VANDERBILT AVENUE, BROOKLYN, N. Y.

The Nineteenth Annual Banquet of the New York Branch will be held at the Aldine Club, 200 Fifth Avenue, New York City, on February 18, 1928. All members expecting to attend are urgently requested to make reservations early in order to avoid the crowding and discomfort which seriously hampered our last banquet. The attendance will be limited to 500, and reservations must be in by February 11. No tickets will be sold at the door. Banquet committee consists of: Chairman, Phillip Morningstar, 16 Golder Avenue, Jamaica, N. Y.; Secretary, Ralph Liguori, 127 Vanderbilt Avenue, Brooklyn, N. Y. Booklet Committee Chairman, Arthur Grinham, 1147 Broadway, New York.

INTERNATIONAL FELLOWSHIP CLUB

HEADQUARTERS, CARE OF W. J. SCHNEIDER, BOX 119, TIMES SQUARE STATION, NEW YORK

The International Fellowship Club, an organization for the purpose of improving conditions among the trades which sell equipment and supplies to electroplating shops, will hold its next meeting in New York on February 18, 1928. This meeting will be held together with a luncheon, at the Aldine Club, 200 Fifth Avenue, at 1.30 p. m.

The New York Branch of the American Electroplaters' Society is to hold its annual banquet the same day, also at the Aldine Club, and this will give members of the International Fellowship Club an opportunity to attend both functions.

The meeting of the Club will be presided over by Frank J. Clark, vice-president. The principal speaker will be Fred G. Space, of the Seymour Manufacturing Company, Seymour, Conn., who is a past president of the Connecticut Chapter of the Purchasing Agents' Association and a director of the National Association of Purchasing Agents. Other business of the meeting will cover ways and means of obtaining funds needed to carry on campaigns; increasing membership; other items of importance. All those interested in selling to the plating trades should attend. Please communicate with W. J. Schneider, Box 119, Times Square Station, New York.

AMERICAN ELECTROCHEMICAL SOCIETY

HEADQUARTERS, COLUMBIA UNIVERSITY, NEW YORK

The American Electrochemical Society celebrated its Silver Jubilee at its Spring Meeting, April, 1927, at Philadelphia. Among the many members attending the Meeting were thirteen Charter Members. The main festivities took place at the Old Mohican Club, Morris-on-the-Delaware, N. J. Prof. Edgar Fahs Smith was toastmaster, and addresses were made by Prof. Louis Kahlenberg, of the Unveirsity of Wisconsin; Mr. Lawrence Addicks, the well-known copper metallurgist; and Prof. Wilder D. Bancroft, of Cornell University.

The Spring volume of the Society covers an excellent review of the development of electrochemistry during the past twenty-five years, being a compilation of papers by twenty-three authors. The main technical session of the meeting was devoted to the very live topic "Gaseous Reduction of Ores and Other Metal Compounds." The main Scientific Session was held on April 29th and was devoted to papers on "The Electrochemistry of Concentrated Solutions." Prof. Hugh S. Taylor of Princeton presided and the session was featured by an address from Prof. Peter Debye of Zurich, now of Leipzig, Germany. Our knowledge of concentrated solutions is still meagre, yet the importance of this subject is readily appreciated when we take into account that most of the commercial processes with aqueous solutions are carried out with concentrated solutions.

In the Fall of 1927, the Society undertook a trip through the Northwest, visiting all the important electrochemical and electrometallurgical plants in the Northwestern States and in British Columbia. Of particular interest were the large electrolytic zinc plants, the new electrolytic cadmium plant, and the rapid growth of the industries in the State of Washington and the Province of British Columbia. The benefits of this Northwestern trip are inestimable. Many members of the East realized for the first time that the future center of the electrochemical industry of this country is rapidly shifting westward. Among the participants in the trip were members from Norway, Belgium and Germany.

At the 1928 Spring Meeting of the Society, which will be held at Bridgeport, Conn., Hotel Stratfield. headquarters, the main topic of discussion will be "The Chemical Production of Electricity." There will be papers on dry cells, storage batteries, electrolytic rectifiers, standard cells, etc. Dr. G. W. Vinal, of the Bureau of Standards, will preside at this session and a large attendance is expected.

One of the sessions, Friday morning, April 27th, will be a joint session with the National Electric Light Association, and will be devoted to the discussion of Industrial Electric Heating. In the afternoon excursions will be undertaken to neighboring plants, in particular brass, silver and electric furnace plants. The morning of Saturday, April 28th, will be devoted to papers on the Electrodeposition of nickel, silver, and chromium.

A joint meeting of the American Electrochemical Society, the American Chemical Society, the Society of Chemical Industry and the Societe de Chimie Industrielle was held at Rumford Hall, New York, on February 3, 1928, at which an illustrated lecture on "The Mobilities of the Ions of Electrolytes" was delivered by Dr. Duncan A. MacInnes, of the Rockefeller Institute for Medical Research.

DECEMBER 16, 1927. DR. COLIN G. FINK.

AMERICAN CHEMICAL SOCIETY

HEADQUARTERS, WASHINGTON, D. C.

Dr. S. W. Parr, Professor Emeritus of Industrial Chemistry at the University of Illinois was elected president of the American Chemical Society for 1928.

Dr. Parr is the inventor of illium metal, an acid-resisting alloy used in calorimeters.

Personals

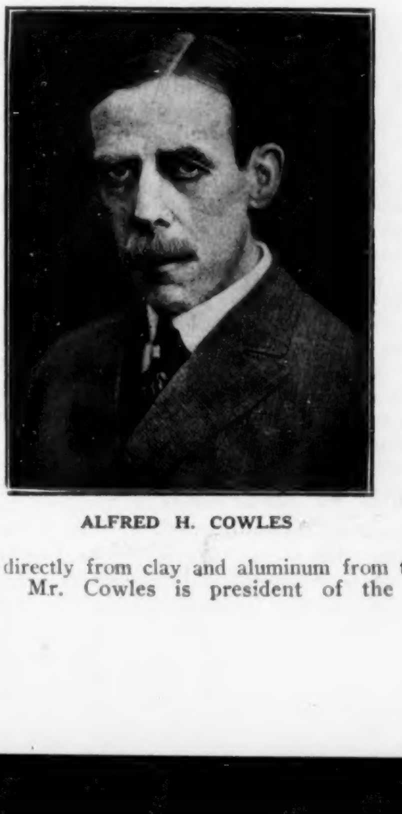
ALFRED HUTCHINSON COWLES

Alfred Hutchinson Cowles, the pioneer inventor of a process for extracting aluminum from bauxite was born in Cleveland, Ohio, December 8, 1858. He attended the public schools of Cleveland and spent two years at Ohio State University. Later, at Cornell University, he devoted himself to scientific interests.

After leaving college Mr. Cowles engaged in mining for a number of years in New Mexico. He sold a mining property and became interested in journalism, joining the Cleveland Leader, which had been founded by his father, the late Edwin Cowles.

In addition, however, he retained his interest in science and did a considerable amount of research work with electric furnaces, concentrating on the recovery of aluminum and the production of alloys of that metal. This work resulted in the organization of the Cowles Electric Smelting and Aluminum Company in 1885, and the erection of the first electric smelting plant in the world, in 1886 at Lockport, N. Y. This plant is still in existence operating under the name of Electric Smelting and Aluminum Company.

By-products of this development were the production of calcium, carbide, carbon, bisulphide, acetylene gas, phosphorus and carborundum. The Cowles Electric Smelting and Aluminum Company soon came into conflict with the Aluminum Company of America, and extended litigation resulted. After years of legal battle the Cowles company was declared the legal owner of the patents covering the electrolytic process of recovering aluminum, the Aluminum Company of America declared an infringer of this patent. Following this decision a settlement was made between the two companies whereby the Aluminum Company became a licensee under the Cowles and Bradley patents for the manufacture of aluminum. Mr. Cowles has of late years been interested in developing a process for the manufacture of alumina directly from clay and aluminum from the alumina.



ALFRED H. COWLES

Mr. Cowles is president of the Electric Smelting and

Aluminum Company of Lockport, N. Y., having held that position since 1895. He was president of the Pecos Copper Company from 1902 to 1918 and was vice-president of the Cleveland Leader Printing Company from 1899 to 1904. He, with his brother, was awarded the Elliott Cresson and the John Scott Legacy Medals at Franklin Institute in 1886 and the Paris Exposition Gold Medal in 1889.

He is a Fellow of the American Institute of Electrical Engineers and the American Association for the Advancement of Science; a founder member of the American Electrochemical Society of which he was vice-president, 1908-1909; a member of the American Institute of Mining and Metallurgical Engineers, the Mining and Metallurgical Society of America and the Franklin Institute.

Mr. Cowles was married in November, 1906, to Helen J. Wills, daughter of James Mortimer Wills, founder of the U. S. Stoneware Company of Akron, Ohio. His residence is Sewaren, N. J.

The Lincoln Electric Company of Cleveland, Ohio, announces the retention of **A. M. MacFarland** as a general sales and development engineer. He will devote his efforts to the development and special application of automatic carbon arc welding, with headquarters at Cleveland.

Richard A. Dimon, formerly with the United States Bureau of Standards, has become associated with the Scovill Manufacturing Company, Waterbury, Conn., having resigned his government position.

J. Homer Winkler has resigned his position as Senior Laboratory Assistant at the United States Bureau of Standards, to become assistant manager of the Buffalo Electrotype and Engraving Company, 64 South Division St., Buffalo, N. Y. Mr. Winkler has been an ardent student of the science of electrotyping. He is a chemical engineer and a member of the American Electrochemical Society, The American Association for the Advancement of Science, and was at one time research associate for the International Association of Electrotypers.

O. C. Bornholt has been appointed vice-president and general manager of the Oakes Company, Indianapolis, Ind., manufacturers of metal automotive parts, stampings, etc.

Charles E. Attwood is now president for the Attwood Brass Works, Grand Rapids, Mich., having been elected to succeed the late Charles F. Attwood.

Harry O. King, vice-president of the Bassick Company, Bridgeport, Conn., has been elected president of the Magazine Repeating Razor Company, South Beach, Conn., manufacturers of the Schick Repeating Razor. W. B. Lashar, president of the American Chain Company, has been elected chairman of the board of the razor concern.

William J. Hawkins, in charge of sales in the Boston district for the Bridgeport Brass Company, heads that company's new offices at 1060 Park Square Building, Boston, which have just been opened. Mr. Hawkins has been with Bridgeport Brass for more than 20 years.

Harvey Hubbell, Jr., has been elected president and will succeed his father, the late Harvey Hubbell, as active head of Harvey Hubbell, Inc., Bridgeport, Conn., manufacturers of electrical specialties, machine screws and other appliances.

Percy S. Brown is now Deputy Director of the International Management Institute at Geneva, Switzerland.

David L. Cable is now associated with The Ferro Enamel Supply Company of Cleveland, Ohio.

Russell H. Pellington has been engaged as New England representative for The Matchless Metal Polish Company, Glen Ridge, N. J.

Emil Troxler has been appointed representative for The Matchless Metal Polish Company, Glen Ridge, N. J., to cover the Metropolitan District of New York.

George J. Sargent, of Pittsfield, N. H., widely known as an expert on the electro-deposition of chromium, has joined the technical staff of United Chromium, Inc., New York.

James A. Parsons, metallurgist of the Duriron Company, Dayton, O., has been awarded first prize in science by the Harmon Foundation, under the Harmon Awards for Distinguished Achievement Among Negroes. Mr. Parsons was chosen for his special research in aluminum bronze.

Walter Hornbruch, formerly chief chemist and research engineer of the Balbach Smelting and Refining Company, with which concern he was connected for fifteen years, has organized the Standard Testing Laboratories, Inc., 93 Hyatt Avenue, Newark, N. J. The firm specializes in weighing, sampling, representing and assaying. There is a special department for rare metal analysis.

Obituaries

RICHARD J. THOMAS

Richard J. Thomas, president of the Maas Carbonator Company, inventor and pioneer in industry in Wisconsin, died on December 28, 1927, at the age of 78, at his home, 99 Nineteenth St., Milwaukee, Wis., after a protracted illness.

Mr. Thomas was born in Waukesha County, Wis., in 1849. At the age of fifteen he went to Chicago, where he spent four years learning the brass finishing trade. He later attended Carroll College, Waukesha, Wis., and in 1872 he entered business in Milwaukee as an associate of the late H. P. Yale, manufacturing brass valves and plumbing goods. In 1879. Mr. Thomas established the Thomas Brass and Iron Company, starting the manufacture of electrical apparatus as well as other products. He was granted the first Milwaukee franchise for the supply of electric power. In 1894 he removed his plant to Waukegan, where he obtained a franchise to supply power for the first electric street car line from Waukegan to Chicago. He organized the Maas Carbonator Company in 1915, which manufactures water power and electric soda water carbonators, and valves, gauges and other apparatus allied to this line.

GEORGE V. SHEPARD

George V. Shepard, assistant division superintendent of the New Departure Manufacturing Company, Meriden, Conn., died on December 18, 1927, following a long illness. Mr. Shepard was 36 years of age. He was born at West Hartford, Conn., and at the age of twenty-two he entered the employ of the New Departure company, Hartford Division, as foreman of the millwright department and served in this capacity for two years when he was advanced to be plant engineer of that division, a position he held for five years before going to Meriden with the opening of that division in 1920 to fill a similar position.

GEORGE W. TRAUT

George W. Traut, vice-president of the North and Judd Company, New Britain, Conn., manufacturers of hardware and metal specialties, died on December 29, 1927, at the age of 56. Mr. Traut formerly was president of the Traut and Hine Manufacturing Company.

George Washington Traut was born in 1869 at New Britain, where he attended school in preparation for Yale University, which he entered in 1888. A year later his father, J. A. Traut, in association with the late Henry C. Hine, organized the Traut and Hine Manufacturing Company, and the young man left college to become associated with this industry. Upon the death of his father in 1908, Mr. Traut became president of the firm, holding the position until purchase of the company by the North and Judd Manufacturing Company, of which he became vice-president. He was active in civic affairs in New Britain, especially as regarded public education.

DONALD PERSHING CARTER

Donald Pershing Carter, New York district manager for the W. W. Sly Manufacturing Company, Cleveland, O., died recently at that city. He had been with the Sly company since 1921; previously, Mr. Carter had been with the B. F. Sturtevant Company, the Massachusetts Blower Company, Baltimore, Md., and the Foundation Company, New York. During the war he served as a captain in the Chemical Warfare Service of the United States Army. He graduated from the mechanical engineering school at Cornell University in 1904.

THEODORE MICHEL

Theodore Michel, founder of the Union Brass and Metal Manufacturing Company, and pioneer manufacturer of St. Paul, Minn., died at Denver, Colo., on December 22, 1927, at the age of 64. Mr. Michel was the founder of four St. Paul concerns besides the Union Brass.

EDWARD D. WITTMAN

Edward Diehl Wittman, president of the Atlas Brass Foundry Company, Columbus, O., suffered a stroke of heart disease and died on January 8, 1928, at his home in Columbus. He was 38 years of age, and up to the time of his death he had apparently been in good health.

ERNEST JAMES SHAW

Ernest James Shaw, sales manager of the Wallaceburg Brass and Iron Company and former president of the Detroit Brass Works, died suddenly at his home in Wallaceburg, Ont., recently. He was well known in the Detroit territory.—F. J. H.

JOHN NASHER

John Nasher, vice president and a founder of the Globe Engraving and Electrotyping Company, Chicago, died Jan. 9th. Mr. Nasher was 56 years of age, and had been active in the business of his company for forty years. He is survived by his wife, Mrs. Anna Nasher, two sons, John Jr., and Earl and two daughters, Mrs. Irene Brosius and Mrs. Ida Frey.—A. P. N.

JOSIAH S. CRAPON

Josiah S. Crapon, New England manager of the National Enameling and Stamping Company, and president of Homer Brothers Company, Boston, Mass., died on December 17, 1928, at his home at Quincy, Mass. He was 64 years of age.

HARVEY HUBBELL

Harvey Hubbell, president of Harvey Hubbell, Inc., Bridgeport, Conn., manufacturers of electrical specialties and machine screws, died on December 17, 1927, at his home in Bridgeport. He had been engaged in manufacturing operations in Bridgeport since 1888.

NEWS OF THE INDUSTRY

Industrial and Financial Events

FOUNDRY FIRMS COMBINE

Announcement is made of the purchase of the Broadway Iron Foundry Company at Cambridge, Mass., by the Barbour Stockwell Company of the same city. The plant will continue to be operated for the present by the Barbour Stockwell Company with Robert C. Bird as manager. Eventually the plant will be dismantled and the business transferred to the Barbour Stockwell plant. The foundry department will make castings in brass, bronze, and aluminum in addition to the regular production of gray iron and semi-steel. All the other departments, engineering and research, pattern, machine and instrument, will continue their activity during the coming year.

BOHN ALUMINUM AND BRASS

Bohn Aluminum and Brass Company, Detroit, Mich., has terminated negotiations for the purchase of the Michigan Smelting and Refining Company, having found the terms offered by Michigan Smelting unsatisfactory. The Bohn company had planned to acquire Michigan Smelting in order to expand and diversify its output.

A contract has been awarded the Bohn Aluminum and Brass Company by the Chevrolet Motor Company for the supply of Nelson Bohnalite aluminum pistons for the 1928 model Chevrolet car. The Bohn company recently completed a new plant and can produce about 8,000 pistons daily.

BABBITT-METAL CONSUMPTION

The total apparent consumption of Babbitt metal in December, 1927, based on reports received by the United States Department of Commerce from 31 firms, was 4,465,787 pounds as compared with 4,505,954 in November and 4,508,198 in December, 1926. The annual total for 1927 was 60,111,843 pounds, as compared with 65,934,782 pounds in 1926. This consumption is calculated from sales by manufacturers and consumption by those firms (among them several important railroad systems) which consume their own production.

FIRE DESTROYS TUBE MILL

The tube mill building of the British-American Metals Company, at South Second and Clinton Streets, Plainfield, N. J., was destroyed on January 29, 1928, by fire of undetermined origin. Loss of $500,000 was sustained, according to an estimate by an official of the company who stated that the damage was covered by insurance. The greater part of the concrete, brick and steel walls of the building collapsed. Machinery used for making copper and brass tubing for boilers was ruined as was a large stock of tubing. A part of the building was built four years ago. The older part was erected fifteen years ago, and formerly was occupied by the Hibbard-Rodman-Ely Safe Works. The British-American Metals Company has occupied the premises ten years. Dimensions of the building were about 200 x 300 ft.

It was announced that the company would rebuild the tube mill, which employed 250 men.

MOTT-LAIB-COLUMBIA MERGER

Plans for the merging of the J. L. Mott Company of New York and Trenton, N. J., the Laib Company and the Columbia Sanitary Manufacturing Company, both of Louisville, Ky., were recently announced in New York, and the merger is now in process of accomplishment.

The consolidated group, which also includes seven subsidiary companies, will be known as the J. L. Mott Company, Incorporated, and application for a certificate of incorporation has been made. With the extensive Mott plant in Trenton, and the Columbia works at Louisville, the manufacturing and distributing facilities of the new $10,000,000 concern will constitute one of the largest and most complete units in the industry. George H. Laib, president of the Laib Company, will head the new concern.

GENERAL BRONZE BUYS TIFFANY

The General Bronze Corporation, New York, has completed negotiations for the purchase of the bronze and iron works of the Tiffany Studios, comprising a plant covering 2½ acres at Corona, Long Island, N. Y., where 350 workers are employed. The purchase will include the plant, materials, equipment, contracts on hand and good will.

Tiffany Studios has specialized in the manufacture of architectural bronze and iron, lighting fixtures and other metal appliances sold under the Tiffany trade name. The General Bronze Corporation was recently formed by the merger of the John Polachek Bronze and Iron Company and the Renaissance Bronze and Iron Works, and is headed by John Polachek, who was at one time in charge of Tiffany Studios.

BOUNTIES ON GERMAN METAL EXPORTS

Negotiations for a system of export bounties in the German non-ferrous metal industry have at last been brought to a successful conclusion. The foundries, rolling mills and consumers have now agreed on a definite plan. All makers of finished products of copper, tin, lead, spelter, aluminum and brass receive a refund calculated on the difference between the price charged by the mills to have buyers and the price ruling in export markets. These bounties came into operation January 1, 1928, and will be fixed each month by a committee of the various interests concerned.—A. C. BLACKALL.

SAVAGE ARMS TO DIVIDE BUSINESS

Directors of the Savage Arms Corporation are considering a reorganization plan whereby the original firm would become the holding company for two other concerns to which all the Savage business would be transferred. Under the plan to be submitted to stockholders, probably at the annual meeting in April, the J. Stevens Arms Company would take over the manufacture of sporting arms, and a new company would be formed to take over all other manufacturing activities, which will include the production of electric appliances. No new financing will be involved.

NEW MAGNUS PLANT OPERATES

The new plant at Garwood, N. J., of the Magnus Chemical Company, Brooklyn, N. Y., with which is affiliated the Dif Corporation, both manufacturers of industrial cleaning compounds, has been put in operation. The plant, located in the Bell Terminal, underwent considerable alteration before the chemical firms occupied them. This is the third time the Magnus company has found it necessary to go to new quarters as a result of expanding business. It is expected that the Garwood headquarters will fill the company's requirements for some time.

NEW INDUSTRIAL FILMS

An important new educational motion picture film has recently been added to the collection possessed by the United States Bureau of Mines, Department of Commerce. "The Story of the Fabrication of Copper," was made in cooperation with industrial interests, and will supplement the Bureau's ten-reel feature film "The Story of Copper." It shows the processes by which the metal, after it leaves the smelter, is made into the shapes necessary to meet the demands of commerce.

The Bureau's films are loaned to schools, churches, colleges, civic and business organizations, miners' local unions, and other organizations interested in the public welfare. No charge is made for use of the films, but the exhibitor is asked to pay the costs of transportation. Distribution of the films is centered at the Bureau's Experiment Station at Pittsburgh, Pa.

"The Thirtieth Part of a Hair" is the title given to a motion picture film just produced by Norton Company, Worcester, Mass. This film is a picture story of the manufacturing methods in grinding machine production. It brings out clearly a generally unrecognized fact that grinding machines are constructed with the same care as the finest watch.

The film is two reels long and is printed on safety stock of both standard and 16 mm. width. It may be booked, without cost, through the publicity department of the Norton Company, at Worcester, Mass.

CIVIL SERVICE EXAMINATIONS

The United States Civil Service Commission announces the following openings, competitive examinations: Associate Metallurgist, $3,000; Assistant Metallurgist, $2,400.

Applications for associate and assistant metallurgists must be on file with the Civil Service Commission at Washington, D. C., not later than February 21. The examinations are to fill vacancies in the Departmental Service, Washington, D. C., and in the Federal classified service throughout the United States. A vacancy exists in the position of associate metallurgist (ore dressing) in the Bureau of Mines, Department of Commerce, for duty at Houghton, Mich.

THE NATIONAL AUTOMOBILE SHOW

A profusion of examples of the increased use of metals and plated parts in automobiles was seen at the Twenty-eighth National Automobile Show, held at the Grand Central Palace, New York, the week of January 7, 1928. While no radical changes have occurred in the manufacture of motor vehicles, there have been many variations in body design and decoration, and these changes have, as a rule, involved wider use of metals and metallic finishes. More radiators and accessories are now being plated with nickel and chromium than ever before. While nickel plate is still the most widely used metallic finish for automobile parts, it is safe to say that the greatest advance in the past year was in the use of chromium plate.

There has been considerable expansion in the use of non-ferrous metals in preference to iron and steel. The light alloys have been adapted to a number of parts hitherto made of steel, and brass and bronze are being steadily substituted for the ferrous metals. Among others, the following concerns displayed interesting metal accessories:

A. C. Spark Plug Company, Flint, Mach.
American Bosch Magneto Corp., Springfield, Mass.
American Brass Company, Waterbury, Conn.
Art Metal Works, New York City.
Auto Hat Holder Company, Easton,Pa.
Bohn Aluminum and Brass Corporation, Detroit, Mich.
Byrne, Kingston & Company, Kokomo, Ind.
C. G. Spring and Bumper Company, Detroit, Mich.
Continental Motors Corporation, Detroit, Mich.
Connecticut Automotive Specialties Co., Bridgeport, Conn.
Duro Company, Newark, N. J.
Irving Florman Company, New York City.
Hartford Battery Manufacturing Company, New York.
Kelsey Hayes Wheel Corporation, Detroit, Mich.
Kokomo Electrical Company, Kokomo, Ind.
McAdams Company, J. C., Long Island City, N. Y.
Metal Stamping Company, Long Island City, N. Y.
Monroe Auto Equipment Mfg. Co., Monroe, Mich.
Moto-Meter Company, Long Island City, N. Y.
National Battery Equipment Company, New York City.
National Chromium Corporation, New York City.
National Electric Corporation, Newark, N. J.
O. K. Vacuum Brush Sales Company, New York City.
Penberthy Injector Company, Detroit, Mich.
Radiator Specialty Company, Charlotte, N. C.
Shore Instrument & Mfg. Co., Jamaica, N. Y.
Sturges Multiple Battery Corporation, Jamaica, N. Y.
Seth Thomas Clock Company, New York City.
Tiffany Manufacturing Company, Newark, N. J.
Trico Products Company, Buffalo, N. Y.
U. S. Auto Lamp Manufacturing Co., Inc., New York.
Veeder Manufacturing Company, Hartford, Conn.
Wahl Company, Chicago, Ill.
Wolverine Bumper & Specialty Co., Grand Rapids.

The following were among the exhibitors of equipment:

Carborundum Company, Niagara Falls, N. Y.
DeVilbiss Company, Toledo, O.
General Electric Company, Schenectady, N. Y.
United States Electrical Tool Company, Cincinnati, O.

KINGSTON PRODUCTS CORPORATION

Kingston Products Corporation, Kokomo, Ind., has been formed by the merger of the Kokomo Brass Works, the Kokomo Electric Company and Byrne, Kingston and Company, all of Kokomo, Ind. The consolidation is expected to make for economy of operation and wider opportunities for service. All three concerns have been in existence for more than a quarter century.

ENGINEERING-ECONOMICS FOUNDATION

The Engineering-Economics Foundation, 3 Joy Street, Boston, Mass., an organization devoted to scientific research in the growth of wealth and the work done in connection with this growth, will hold a full-day session as part of the National Editorial Conference at Boston, Mass., February 9 and 10, 1928. At this session, discussion will be centered on the development of the editorial phase of Dr. Hollis Godfrey's case study of the business papers' part in the growth of wealth, which is considered to be an important advance in business paper theory and practice.

GERMAN ALUMINUM PRODUCTION

For the first three-quarters of the present year Germany's imports of bauxite and cryolite for her aluminum industry show a substantial increase over those for the corresponding period of 1926—396,673 against 192,372 tons. The total imports in 1926, which were about the same as in 1925, amounted to 236,548 tons. Imports from Hungary up to and including September of this year, following on the discovery of bauxite in that country, totaled 180,224 tons, against nothing in 1926. Imports from other countries were as follows:

	—First nine months—	
	1927	1926
	Tons	Tons
France	106,668	90,011
Italy	53,930	69,890
Jugoslavia	47,477	.....

Germany's aluminum exports for the first nine months of 1927 were 4,239 tons, against 10,758 tons in 1926, while imports were 8,001 tons, against 3,556 tons. These figures would seem to indicate a strong domestic market for aluminum.—A. C. B.

TELEPHONE CONSTRUCTION

A new long distance plant expected to cost nearly $38,000,000 is included in the 1928 construction program of the long lines department of the American Telephone and Telegraph Company. A plant costing approximately $36,000,000 was constructed in 1927, and while that was the record to date, for any one year, it is expected to be exceeded by nearly six per cent in 1928. The proposed expenditures for plant construction during 1928 include the following:

Aerial wire work, including new pole lines, $4,341,000; long distance cables with associated underground conduit, pole lines, loading coils, buildings and equipment, $19,791,000; switchboards and other telephone and telegraph equipment, $9,519,000; line work, including pole replacements, line changes, etc., $4,345,000.

MOTOR BOAT SHOW

The Twenty-third National Motor Moat Show, held at the Grand Central Palace, New York, during the week of January 20, 1928, displayed some tendencies of interest to the metal and plating industries. Increased applications of non-ferrous metals, as well as metallic finishes, in the construction and refinement of the small power craft on display was an indication of the trend in modern industry toward the use of metals. Plated finishes have been adopted by many builders in their efforts to beautify as well as to increase the utility of their products. The exhibits at the show last month were in remarkable contrast to the boats that were displayed only a few years ago. As in motor car design, much attention has been given to proportion and decoration, with the result that there are now being constructed more boats of the long, slim type than hitherto. With this has come a desire to beautify the hulls and cabins, which has made for the adoption of a number of distinctive tops, seats, steering wheels and interior decorations that have been fashioned after the corresponding parts of both the open and closed automobiles.

Castings and forgings, as well as countless machined parts and accessories, are being incorporated in motor boats in increasing volume. A great deal of aluminum is being used in producing lighter engines. Brass, bronze, and a few other non-ferrous alloys predominate as the metals for fittings and accessories in marine use, with the ferrous metals decidedly in the background.

An item of especial interest to the metal trades was the display of "Slipper" outboard motor boats built entirely of metal by the Alloy Boat Company, Buffalo, N. Y.

Among the exhibitors of metals were: The American Brass Company, The International Nickel Company, Columbian Bronze Corporation, Durkee Manufacturing Company, Inc., The Durkee Company, Inc., Light Manufacturing and Foundry Company, M. L. Oberdorfer Brass Company, Hyde Windlass Company, National Carbon Company, Inc., The Paragon Gear Works, and the Alloy Boat Company.

INCORPORATIONS

Allen-Hough Manufacturing Company, Milwaukee, Wis., has been organized to manufacture portable phonographs and other specialties, with headquarters at 383 Milwaukee Street. The company has acquired a plant at Racine, Wis., as well as the phonograph division and producing facilities of the Lifton Manufacturing Company, New York.

William Christensen Company, Inc., York, Pa., has been organized to fabricate structural iron and steel, ornamental iron, and brass and bronze products, having taken over the plant operated by William Christensen. The company states it is not in the market for additional equipment; occasionally it purchases rolled brass and bronze bars and sheets.

Alco, Inc., 98 Thirteenth Avenue, Newark, N. J., has been organized to manufacture automobile lubricating devices, and plans to erect a plant some time in the future. At present the company is having its castings made outside, and present manufacturing is being done under contract.

Business Reports of The Metal Industry Correspondents

NEW ENGLAND STATES

WATERBURY, CONN.

February 1, 1928

All the officers and directors of the **Chase Companies, Inc.,** were reelected at the annual meeting of the concern on January 17, 1928. They are: president, **Frederick S. Chase**; vice-president, **Irving H. Chase**; treasurer, **Richard D. Ely**; secretary, **R. L. Coe**; Assistant secretary and general counsel, **Charles E. Hart**; directors, **F. S. Chase, I. H. Chase, R. D. Ely, R. L. Coe, Rodney Chase, Arthur Reed Kimball, Fred A. Jackle** and **J. R. Van Brunt.** President **F. S. Chase** reviewed the concern's business of the past year, paying special attention to the acquisition of the **U. T. Hungerford Company** and the more recent acquisition of the **Ohio Brass and Copper Company.**

The following officers were reelected at the annual meeting of the Randolph-Clowes Company last month: president, **Ralph H. Smith**; vice-president and Secretary, **H. L. Farnum**; treasurer, **Wilbur P. Bryan.** The above officers also constitute the board of directors.

Officers of the **Smith and Griggs Manufacturing Company** were reelected at the annual meeting last month as follows: President and treasurer, **Ralph H. Smith**; secretary and assistant treasurer, **Robert J. Eggleton**; Directors, **Ralph H. Smith, Archer J. Smith, Julius B. Smith, Wilbur P. Bryan, Irving H. Chase** and **John P. Elton.**

The Connecticut Chamber of Commerce is compiling a

daily bulletin on **"Connecticut Facts."** One of these states: Connecticut's leading industry is the manufacture of brass goods and allied commodities, centered in Waterbury and located almost exclusively in the Naugatuck valley. Sixty-four plants in the Valley during 1925 produced one-third of the total output of these goods in the United States. The value of these products was $519,725,195 and Connecticut's share was $156,141,974. It led every other state. More than 20,000 wage earners were engaged in the industry in this state in 1925 and several thousand salaried employes. Materials cost $102,688,562 and wages amounted to $28,339,321. This compares with 58 plants products valued at $48,526,968; 13,277 employes; $7,597,084 wages and $36,185,970 materials used in 1900. The largest single brass making and fabricating plant in the world is in Waterbury. Next to Connecticut, New York turns out the most brass goods, its products in 1925 amounting to $89,875,000, Michigan, Illinois and Pennsylvania following next in the order named, their total products being $125,000,000. Another bulletin states that half the needles, pins, hooks and eyes and snap fasteners produced in the country are made in Connecticut, the 13 plants making them being in the Naugatuck valley, particularly Waterbury, Torrington and Winsted. Their production in 1925 was vaued at $8,094,-799; 2,371 persons employed; wages received, $2,429,878; materials cost $2,916,525.

The government has made the following refunds locally on the income taxes for the period 1925-1926: **American Pin Company,** $5,011; **Oakville Company,** $10,097; a second refund to the latter company of $2,957; Ralph H. Smith of the **Smith and Griggs Company** and the **Randolph-Clowes Company,** $722. The two companies named are owned by the **Scovill Manufacturing Company.**

President F. S. Chase of the **Chase Companies,** and **Vice-President John H. Goss** of the **Scoville Manufacturing Company** were the speakers at a dinner given to **Congressman John Q. Tilson** at the Union League Club of New Haven last month.

Over 100 sales representatives of the **Chase Brass and Copper Company** gathered here last month for a sales conference. Cities represented were New York, Boston, Baltimore, Pittsburg, Cincinnati, Cleveland, Detroit, St. Louis, New Orleans, Dallas, Rochester, Newark, Philadelphia, Chicago, Denver, Los Angeles and San Francisco. Sales talks were given, an inspection of the mills and factories made, and talks given on the products. A feature of the banquet was a mock wedding symbolizing the union of the company with the **U. T. Hungerford Brass and Copper Company** a year ago.

Vice President John H. Goss of the **Scovill Manufacturing Company** has presented the State library at Hartford two of the **Scovill** centennial medals struck in 1902.

L. B. Marcy, for the past eight years connected with the **Waterbury Manufacturing Company** in a supervisory capacity, has resigned and become factory manager of **Alfred Vestor and Sons, Inc.** of Providence, manufacturers of lighting fixtures and metal stampings.

President John A. Coe of the **American Brass Company** says concerning the prospects for the coming year: "In my opinion the country is on a solid business foundation and in spite of this year being a presidential year, it is my opinion that business will not be affected adversely. The new program adopted by the Ford Motor Company will act as a stimulus to the automobile business and this, together with advancing markets for raw material, should help the manufacturers of the Naugatuck Valley. Adjustments are going on all the time. Some things are being deflated and others inflated, but the average is generally for stabilization. I believe most concerns are now using buildings and equipment provided during the war which for a time were not used."

President F. S. Chase of the **Chase Companies, Inc.,** concerning the present outlook, states: "Our impression is that the brass mill business is, roughly speaking, from 5 to 10 per cent less than it was a year ago and our best sizeup is that it will continue about like this for some months at least. Many factors have a bearing on this such as continued easy money, reasonable crops, etc., but a most important condition to us brass makers is the continued reasonable price of copper. Should there be a material increase in this over the present price it would further reduce the volume of our business.

"We are hazarding the above guess as to the future based on the explanation that while there are some mines that cannot produce copper at a profit in the vicinity of 14 cents, there are others whose production can be greatly increased which can make a very handsome profit at that figure. In these days of cerative chemistry and the successful introduction of various substitutes for what has been considered standard material heretofore, the large copper producers should be conservative about running the risk of curtailing the consumption.

"It will be unfortunate if there is any greater recession in business as such reduction in volume will tend to eliminate the margin of profit which, owing to increasingly keen competition last year, has been reduced to a minimum. In short, if the volume of general business does not further recede and if our raw materials are not unduly inflated, we believe the prospect is reasonably good."

Douglas Godrey, former employe of the local plant of the **Chromium Corporation of America,** who fled some time ago, was arrested in Boston last month and brought back here on the charge of embezzling $1,250 from the concern. He has been bound over to the superior court on bonds of $2,500. —W. R. B.

BRIDGEPORT, CONN.

FEBRUARY 1, 1928

The **General Electric Company** is planning to enlarge its plant here. The officials are negotiating with the city authorities for the purchase of 30 acres of land at the Hillside home, where they plan to erect several more factories. It is understood that $25,000 has been offered for the land.

The **Bassick Company,** a division of the **Stewart-Warner Speedometer Corporation,** has acquired the **Columbia Phonograph Company** plant at a price said to exceed $300,000. Extensive changes are to be made at once and it is possible that the company's branches at Meriden and Newark, N. J., may be concentrated here, with 1,500 employes.

A report just issued by the **Connecticut Chamber of Commerce** states that since 1904 Bridgeport has led all Connecticut cities in the value of manufactured products. It succeeded to New Haven's place in that year and has kept it ever since. Its value of manufactured products in 1925 was $149,098,353. This compares with $33,536,000 in 1899.

Among increases in assessments of property for taxation made by the city are the following: **General Electric Company,** $1,203,187; **Remington Arms Company,** $495,068; **American Chain Company,** $25,254; **Bridgeport Screw Company,** $15,894; **Bryant Electric Company,** $5,913; **Bridgeport Metal Goods Company,** $45,125; **Crane Company,** $216,108; **Dictaphone Corporation,** $17,643; **Remington Cutlery Company,** $218,709; **Harvey Hubbell, Inc.,** $49,114; **Stanley Works,** $81,260. Decreases were made as follows: **Bridgeport Brass Company,** $445,031; **International Silver Company,** $34,369; **Acme Shear Company,** $1,551; **Armstrong Manufacturing Company,** $21,130; **Singer Manufacturing Company,** $6,234.

The long standing dispute between the city and **Jenkins Brothers** resulting from the assessment of its property when it bought it from the **Crane Company,** has been adjusted in favor of the company. The city has accepted its valuation of $795,381 for the 1920 list instead of $1,441,662, originally set. This will save the corporation about $25,000 in taxes.

Walter B. Lashar, president of the **American Chain Company,** was the recipient last month of letters demanding $25,-000 under threat of violence to himself and family unless paid. Guards have been set around his home.

The **Sprague Meter Company** has received a refund amounting to $7,587 from the government for income taxes paid in excess.—W. R. B.

CONNECTICUT NOTES

FEBRUARY 1, 1928

NEW BRITAIN.—Harris Whittemore, Jr., of Naugatuck, was elected a director of **Landers, Frary & Clark** last month to succeed his father, the late **Harris B. Whittemore,** who died the preceding month. The company last month voted its regular quarterly dividend of three per cent and an extra

dividend of four per cent. **American Hardware Corporation** last month declared its regular quarterly dividend of four per cent and an extra dividend of $1 per share. **Union Manufacturing Company** declared its regular quarterly dividend of two and one-quarter per cent.

Waldo E. Gilbert, 71 years old, an employee of the **P. & F. Corbin Company** for over 50 years, died last month. He had been foreman of the butt department for 35 years.

A bulletin issued by the Connecticut Chamber of Commerce states that in 1925 Connecticut's output of hardware was $88,025,798 or 39 per cent of the total for the United States. The bulk of this was manufactured in New Britain, which is designated as the hardware center of the United States.

HARTFORD.—Local concerns whose assessments for city taxation have been raised and the amounts of the increases are partly as follows: **Underwood Typewriter Company**, $3,662,500; **Colt Fire Arms Company, $3,489,900; Pratt and Whitney Company, $3,454,300; Royal Typewriter Company**, $1,749,400; **Whitney Manufacturing Company, $1,391,346; Billings and Spencer Company, $1,215,200; Hartford Machine Screw Company, $1,043,400; Arrow Electric Company, $1,-**025,080.

Pratt & Whitney Aricraft Co. announces that manufacturing rights to its aviation engines have been given to the **Bavarian Motor Works** of Munich, Germany.

BRISTOL.—President **DeWitt Page** of the **New Departure Manufacturing Company** is recuperating from an operation performed last month at the Hartford hospital. **Joseph B. Sessions** of **Sessions Foundry** has been reelected president of the **Bristol Trust Company. De Witt Page** of the **New Departure Company** and **Walter Ingraham, William Ingraham** and **Edward Ingraham** of the **Ingraham Clock Company** have been reelected directors of the **American Trust Company** and the **Bristol National bank.**

TORRINGTON.—E. E. Taylor, formerly of the sales and advertising department of the **Turner and Seymour Manufacturing Company** and later identified with the **Hendey Machine Company,** is one of those who have contributed to a book on advertising entitled "Advertising Research."

THOMASTON.—Edward McCoul, superintendent of the **Seth Thomas Clock Company,** addressed the Kiwanis Club of New Britain last month on the story of clock making in the state. One of the earliest makers was the original **Seth Thomas.** He told that for four generations descendants of **Seth Thomas** have been presidents of the concern, each bearing the name of **Seth.** One of the largest clocks it has installed is that of the **Colgate Company** at Jersey City, N. J., which cost $40,000 and has a 50-foot dial.

TERRRYVILLE.—Officers of the **Chapman Machine Company** were reelected last month as follows: president, **Clarence M. Chapman**; vice president, **Matthew F. Hayes;** treasurer, **C. M. Chapman;** secretary, **Noble E. Pierce;** directors, **Matthew F. Hayes, C. M. Chapman, Albert Mitchell, Noble Pierce** and **Max Hotkoski.**

NEW HAVEN.—Louis Liggett, a director of the **Winchester Arms Company,** has sent President Coolidge a present of the one millionth rifle manufactured by that company. The rifle is a Model 94 and differs in no way from the other rifles turned out except that it bears the number 1,000,000.

SOUTHINGTON.—Atwater Manufacturing Company has received orders from the **Ford Motor Company** for the manufacture of small parts which will keep it busy for the next year or more. It formerly made parts for the old Ford car but during the time the Ford Company was changing over its plant for the new model, no orders were received by the local concern, with the result that it was practically shut down. Now, however, it is once more operating at full speed.

MIDDLETOWN.—Russell Manufacturing Company directors have declared a quarterly dividend of one and one-half per cent on the common stock, payable February 15, 1928. This is the first dividend declared since 1924. **President T. Macdonough Russell** said following last month's meeting that he sees no reason why the company should not continue to pay dividends on a six per cent annual basis. The past year was one of the best the company ever had, he said, and the company reduced its notes payable by $300,000 and added almost that amount to its surplus.—W. R. B.

PROVIDENCE, R. I.

PROVIDENCE, R. I., JANUARY 31, 1928

Business during the opening month of the new year has fully justified the optimistic prophesies that were occasioned by conditions prevailing at the close of 1927. Unusually mild weather conditions have enabled uninterrupted operations on the numerous large building projects that are under way in this city. This has stimulated a continually increasing demand for small tools and building materials. Other metal lines are also sharing in the healthy reaction, especially the jewelry and allied ines, which are now enjoying the best spring business since the war.

The three-day sales conference of the **Gorham Manufacturing Company,** at the plant in Elmwood, on January 4, 5 and 6, was one of the best ever held by that organization, both in point of attendance and of results attained. There were representatives from all selling districts, Boston to San Francisco. There were general sessions mornings and afternoons and district meetings on two evenings, the final evening being given over to a dinner and entertainment at the Squantum Club on Narragansett Bay. Luncheons each day were served at the Gorham Casino, as well as dinners each night. Every phase of merchandising, shipping, displaying and introducing Gorham products were discussed with addresses by leaders in various departments of the work. At the district meetings the particular problems of each section were threshed out and solutions proposed. New merchandise for 1928 was described and explained by President Edmund C. Mayo and all the salesmen were afforded an opportunity of familiarizing themselves with the new goods preparatory to launching a vigorous selling campaign throughout the country.

The E. M. Dart Manufacturing Company has increased its capital stock from $800,000 to $1,500,000, according to an amendment to its charter that has been filed at the office of the Secretary of State.

J. C. Brady, Inc., has been granted a charter to conduct a plating business with a capital stock consisting of 500 shares of common without par value. The incorporators are Joseph C. Brady, John J. Hogg and George W. Bugbee.

S. & E. Manufacturing Company Inc. has been incorporated under the laws of Rhode Island to manufacture jewelry, novelties, etc., with capital stock consisting of 200 shares of common, no par value. The incorporators are Wilbur A. Scott, Barney Efros and R. L. Sohn.

Dryer Motorcraft Corporation has been incorporated with a capital stock of $100,000 consisting of 1,000 shares of preferred of $100 each and 2,000 shares of common no par value. The incorporators are Hayward T. Parsons, Roger T. Clapp and W. Harold Hoffman.

Allen Wrench and Tool Company has added 2,000 shares of non-par stock to its capital of $100,000, according to an amendment that has been filed at the office of the Secretary of State in accordance with Rhode Island laws.—W. H. M.

BOSTON, MASS.

The City of Boston is inviting proposals for the supply of metal working machinery for the Grover Cleveland School. Surety bond equivalent to 45 per cent of contract price required.

The Boston Gear Works plant at Norfolk Downs, Quincy, is building a three-story addition which will be completed about April 1. The addition is adjacent to the company's present plant which is being expanded due to lack of space for increased business. A freight conveyor between the two buildings will be installed. The new structure is of steel and concrete.

An auto body shop is being erected for **P. J. Kiley,** 101 Washington Street, Somerville. It will be 93 x 95 feet in area.

Cambridge Sheet Metal Company, 295 Franklin street, Cambridge, producing various metal specialties, including auto bodies, is building a one-story addition 60 x 85 feet.

John F. Duby will manufacture special lighting fixtures in a plant on Hancock Street, Dorchester. The company does a general business in metal specialties.

The New England Council, Statler Building, Boston, reports on the jewelry business of New England as follows:—The business of manufacturing jewelry of all kinds was twelfth in

importance of New England's representative industries and produced 39 per cent of the country's output in 1926. From 1914 to 1926 the value of products increased, although the number of concerns decreased. The industry is concentrated in Rhode Island and Massachusetts. The average plant has been in operation thirty years and the average sales are $300,000 annually, although individual plants vary from $7,000 to over $1,000,000.

A plant addition is about to be started at the **Angle Novelty Company,** of Leominster, Mass.

Chapman Valve Manufacturing Company, Indian Orchard, Mass., has increased its capital stock from $1,500,000 to $3,000,000 and announces that a part of this will be used for expansion.

Chamber of Commerce of Boston has addressed a special inquiry to all airplane manufacturers of the country as to their intentions in regard to new construction and expansion. It offers them full co-operation in the selection of sites for main or branch plants near Boston and any other aid within its power.

A factory building 200 x 65 feet is to be erected soon for the **Worcester Wire Works,** Worcester, Mass.

American Saw and Manufacturing Company, Springfield, Mass., will shortly construct an addition to its plant.

Recent incorporations include the following:—**J. H. Peckham and Sons, Inc.,** North Attleboro, to manufacture jewelry and deal in precious stones and metal ware; capitalized at $200,000, incorporators are William B. Peckham, Charles S. Peckham, and John H. Peckham. **George Lawrence, Inc.,** Cambridge, Mass., special foundry and machine shop; capital stock, 1,000 shares of no par value; Arthur P. Stone, president; J. Hallar Ramsey, treasurer; A. E. Smith, clerk. **Vulcan Equipment Co.,** Boston, to manufacture special machinery; capital stock, $100,000; Charles F. Knowlton, president; Lawrence E. Miles, treasurer.—H. A. L.

MIDDLE ATLANTIC STATES

TRENTON, N. J.

Federal Judge John Rellstab has signed an order awarding administration fees aggregating about $208,000 to receivers, counsel and special masters in the **J. L. Mott Company** receivership, and accepted the final accounting of the receivers. He also approved a deed under which transaction of the Mott holdings here were effected at once. The new owners have already assumed charge. Charles H. Baker and Robert K. Bowman, of Trenton, receivers, received $50,000 each under the court order. Counsel for the Guaranty Trust Company, trustees of the Mott enterprise, received $35,000 for distribution among several attorneys. Aaron V. Dawes and Robert H. McCarter, counsel for the receivers, got $60,000 between them for their services. Identity of the new owners of the Mott plant was revealed in the course of the proceedings as the **J. L. Mott Company, Inc.,** of Delaware, a newly organized firm. **Edwin A. Potter, Jr.,** of New York, who bought the Mott holdings for an aggregate sum of $1,650,000 at the recent public sale here, turned over the purchase to the new firm. In the receivers' final accounting the new owners have agreed to pay 10 per per on all unsecured claims held by creditors. The unsecured claims aggregate $3,690,404. The receivers relinquished their control of the plant with $1,600,000 in orders remaining to be filled. Production on these orders are now under way. The working force of the Mott plant will be kept intact, and will be increased as the business grows.—C. A. L.

NEWARK, N. J.

February 1, 1928

Newark metal manufacturers report that business in some branches is not up to normal, but they are looking for it to pick up in the early spring. Newark is the largest metal manufacturing city in New Jersey and its reputation for brass, copper and aluminum goods is known throughout the country.

A number of new concerns have filed incorporation papers during the month. Those chartered include the following: **H. W. Porter and Company, Inc.** to manufacture electrical appliances, 3,000 shares no par. **So-Mo-Lawn Mower Company,** to manufacture lawn mowers, 100 shares no par. **Thomas Coleman Smelting and Refining Company,** smelting metals, $125,000. **Acme Bar Manufacturing Company,** manufacture electrical equipment, $50,000. **Beaver Electric Company,** electrical equipment, $100,000. **Henry Miner and Son, Inc.,** manufacture chemicals, $100,000 preferred and 1,500 shares common. **Newark Wire Works,** manufacture wire, $50,000. **Universal Humidifier Corporation,** manufacturing cooling apparatus, $100,000 preferred and 1,000 shares common no par. **Motor Vest,** manufacture metal products, 200,000 shares, common. **J. F. Newman,** manufacture jewelry, $125,000. **Benz Manufacturing Company** was incorporated for the manufacture of jewelry, with capitalization of $200,000.—C. A. L.

MIDDLE WESTERN STATES

DETROIT, MICH.

February 1, 1928.

One of the greatest expansion moves in the automobile industry during 1927, was the construction of the **Buick Motor Company's** new $5,500,000 gray iron foundry at Flint. This great foundry is now operating full blast.

Greater possibilities in the use of aluminum as an automotive material are seen by **Col. E. J. Hall,** vice president of the **American Car and Foundry Company,** which manufactures busses and whose plant in Detroit is now operating at capacity. "Our own experience with aluminum motor parts," says Col. Hall "has taught us the value of this material. It has led me to believe that a great step forward will be the development of an all aluminum engine. Alloys of aluminum have already been developed that make feasible such a motor, and it is my belief that it would combine extreme lightness with the other vital factors of efficiency, economy and vibrationless operation to a high degree."

The **Bohn Aluminum and Brass Company,** Detroit, has called for redemption of its entire outstanding $1,350,000 of seven per cent, first mortgage, ten year sinking fund gold bonds, at 102½ and accrued interest. Redemption will take place on March 1, 1928, at the offices of the **Detroit Trust Company.**

The **Kalamazoo Stove Company,** Kalamazoo, Mich., recently increased its capital stock from $500,000 to 100,000 shares of no par value.

Hugh Lyons and Company, Lansing, Mich., reports a decided increase in orders which also has necessitated an increase in employment. This organization is reported to be in the market for brass castings and raw metal materials.

The **American Spring and Manufacturing Company,** Holly, Mich., will shortly be in the market for brass wire, phosphor bronze wire and copper wire.

The Stearns Motor Manufacturing Company, Ludington, Mich., expects that 1928 will see an increase in business of fully 50 per cent. Company is said to be in the market for aluminum.

The **Reynolds Springs Company,** Jackson, Mich., anticipates a decided increase of business during 1928. It will require during the first six months of the year lead, brass, aluminum, zinc, copper and other non-ferrous metals. This company maintains three plants at Jackson and one at Newark, N. J.

The **A. and C. Spark Plug Company,** Flint, contemplates an expenditure in the first half of 1928 of more than half a million dollars for raw materials and supplies. It will require brass, aluminum, zinc and copper.

The **Defoe Boat and Motor Works,** Bay City, Mich., antcipates a good first and second quarter in 1928. Steady employment will be provided. Founders, it is stated, will have an opportunity to supply this concern with brass castings.

The **Douglas and Lomanson Company,** manufacturer of auto body hardware, reports a favorable business outlook. It is said to be in the market for brass, aluminum, zinc and copper for the first six months of the year.

The **F. L. Jacobs Company,** Detroit, manufacturer of auto parts, reports orders at least 15 per cent ahead of last year at this time. This company will require brass castings and other raw material to meet its requirements for the year.

The **Covel Manufacturing Company,** Benton Harbor, Mich., anticipates its usual run of business for the first six months of 1928. It will purchase non-ferrous scrap and other raw material to meet its requirements.—F. J. H.

TOLEDO, OHIO

General conditions in the Toledo territory, particularly in the brass, copper and aluminum field, seem to be just about holding their own. Business in this section, however, has been considerably more favorable than in some of the other lake industrial cities.

So far as reported, there has been nothing outstanding in the opening of the new year. Of course, plants as a rule are not operating at capacity, but most of them are going, and there is a generally optimistic feeling. It is expected business in this field will average about the same as last year and probably continue that way through the greater part of the year.—F. J. H.

CLEVELAND, OHIO

This city, like many other manufacturing centers in the Great Lakes territory, is showing just moderate improvement in the non-ferrous metal fields. The motor car industry has aided things to some extent, but this industry has not altogether made the improvement expected of it shortly before the year began. General business conditions are changed but little from a year ago. The brass, copper and aluminum plants are only moderately busy. Orders come in slowly and the purchase of raw material is limited to immediate requirements. In many instances plants are simply marking time. No one attempts any too optimistic predictions for spring, but in general it might be said that nearly everyone is expecting a change for the better.—F. J. H.

CHICAGO, ILL.

February 1, 1928.

The following Chicago firms have incorporated:

Falk Leadizing Company, Inc.; capital $15,000; by Karl D. Falk, Alfred H. Falk and Charles R. Caslor; company will apply coating of lead and other metal to any other metal or substance.

Chromium Facing Corporation; capitalized with 200 shares of no par value. Incorporators are A. D. Sherman, D. H. Sherman and George A. Giles. The company will engage in general electroplating and die hardening business.

Lowenthal Metals Corporation; capital, $200,000, by Joseph T. Yazitz, Maurice C. Handelman and Fred S. Herzon. The company will smelt, refine, manufacture and sell all kinds of metals. The plant is located at 947 Cullerton Street.

Monarch Pipe & Supply Company has increased its stock from $12,000 to $60,000.

The **Star Smelting & Refining Company,** 508 S. Kolmar Avenue, was incorporated with a capital of $25,000. The company will mine, smelt, manufacture and deal in metals of all kinds. The incorporators are: Donald Korshak, Alexander A. Rotstein and L. L. Becker.

One of the largest new incorporations was that of the **J. G. Braun Company,** 615 South Paulina street, with $500,000 in common stock and $500,000 preferred. The company will manufacture and deal in ornamental works, mouldings, metal work, forgings, etc. The incorporators are: Hubert J. Braun, Lillian T. Braun and F. W. Janson.

Thermal Radiator Corporation, was incorporated with a capital of $40,000 by Eugene Shubert, Chas. F. Fryer, and F. M. Wight. The company will deal in transfer devices and the parts thereof.

MILWAUKEE, WIS.

February 1, 1928.

Building operations in Milwaukee have broken all records. The lighting fixture industry is dependent upon building, and there are quite a number of firms here engaged in this business and they are all kept busy. No exact figures are available as to the amount of business done in the lighting fixture business for the past year in Milwaukee, but a fair estimate would place the amount at $2,500,000, of which approximately $1,500,000 was made in Milwaukee. Engaged in the industry are about 750 people, whose aggregate wages would amount to $650,000.

Bronze screening is expected to gain popular favor all over the state. Screening made of bronze wire is being manufactured in quite large quantities by the **American Brass Company,** at Kenosha, Wis.

The **Gerlinger Brass & Aluminum Foundry Company,** West Allis, Wis., has been formed by George P. Gerlinger, W. E. Gerlinger and Emma E. Gerlinger. The new company will manufacture and sell castings, metal fixtures and specialties. The company is capitalized at $5,000.

The **Quality Aluminum Casting Company,** of which A. G. Harter is treasurer, is taking bids on a new factory addition. The new addition will be used as a foundry for the plant. It will be a one-story building with a steell frame. The amount to be spent on building the new addition is not known, but it will reach a big sum, according to officials.

Some of the local electroplaters attended the **American Electroplaters' Society** banquet and dance which was held at the Palmer House, Chicago, Saturday, January 21, 1928. During the afternoon an educational program featured the gathering.

The electro-plating industry in Milwaukee is going rather slowly at present. Salesmen report that they find the field well-filled and that it is hard to do much business at this time. Conditions will soon change for the better, however, they say.—A. P. N.

OTHER COUNTRIES

BIRMINGHAM, ENGLAND

January 10, 1928

One of the largest aluminum orders ever placed in Great Britain has been obtained by a Wolverhampton firm from a company of Australian buyers. One item comprises 10,000 sets of aluminum stewpans and covers, or 60,000 in all; in addition there are pudding basins, preserving pans and billycans. The consignments will be in monthly instalments. The order was secured mainly because of the modern plant which has been installed. In spite of keen competition larger quantities of aluminum are being sent to various parts of the Empire. There is, however, a good deal of misgiving over the extra 10 per cent tariff now payable on aluminum goods. At present Australia is far away the best customer for British aluminum.

The jewelry season has been very busy, but unfortunately the amount of precious metal turned out in the Autumn compares unfavorably with that of former years. The proportion of cheap jewelry considerably increases, the cheaper stores now taking large quantities of bracelets and similar goods retailing at sixpence. Silverware, however, is still called for in good quantities and gold cigarette cases have had a revival. India, Africa and Canada are increasing their purchases of silverplate.

The metal bedstead trade has suffered a good deal as many foreign countries now produce their own bedsteads. The various constituents, however, are largely bought from Birmingham and the products are freshened by the introduction of new models in various tints and brasses, combined with white ornamented and oxidised silver mounts. The makers note some reversion to favor of the all-metal bedstead. For a long time past wooden bedsteads have been in favor, although these contain a good proportion of metal. Birmingham makers strongly complain of the competition of light hollow-ware in Germany, but their efforts to get the government to apply the Safeguarding of Industries Act have so far been unsuccessful. One effect has been the lightening of the product, much to the distaste of the makers who prefer to keep up quality even though this involves some sacrifice of business.

The non-ferrous tube trades of Birmingham are enjoying

a run of prosperity. Most of the firms are working overtime, largely on tubes for ships and locomotives. There is special satisfaction at the reappearance of the Indian State Railways as buyers of heavy copper fire boxes and rods. South Africa is a very good customer. The activity has coincided with an increase in copper values, two advances of £2 per ton having followed in quick succession in strong brass and ¼d. per lb. in rolled brass and brass wire. The **Birmingham Battery and Metal Company** has been fortunate in getting the orders for the necessary tubes for two Chilian battleships. The revival of shipbuilding has benefited several makers of ship lamps.

The silver industry has expanded a good deal during the year, an important change being that the business has gradually gravitated into the hands of big firms who produce on a large scale, the very small shops are gradually disappearing. The trade has been changed by the introduction of high class machinery and improved management.

Chromium plating has made great progress, being used for the covering of bedsteads and hearth furniture, and as a protection for fittings exposed to damp atmosphere. Two very large installations have this year been completed in Birmingham and Sheffield and they have a great deal of work ahead. Sheffield has had a busy autumn in turning out quantities of sterling silver wire, best cutlery and electroplated hollow-ware. Further progress has been made during the year in the substitution of copper and brass for lead in domestic water conveyance.

Aluminum die castings are coming into wider vogue, especially in the alloyed form of aluminum bronze. The makers of these goods are as busy as they can be, with a very good reserve of business on their books. In stamped brass goods Birmingham holds its own against the Continent, but there are great complaints of loss of business through Continental competition in the illuminating trades where Birmingham is being severely undersold by several Continental nations.—J. H.

Business Items--Verified

Western Brass, Inc., Lloyd Building, Seattle, Wash., has completed plans for a one-story factory which will cost about $20,000 with equipment. The company uses a brass foundry and machine shop, a casting shop, and grinding and plating rooms.

Wallstein Industrial Corporation, New York City, announce the removal of their executive offices and salesrooms to larger quarters in the Green Central Building, 425 Fourth Avenue, at Twenty-ninth Street.

Longview Foundry Company, Longview, Wash., has started operations. Plant is equipped with brass, bronze and aluminum foundry, brass machine shop, casting shop and grinding room. W. M. Reilein is manager.

Gluntz Brass Manufacturing Company, 3001 East Fifty-fifth Street, Cleveland, O., recently sustained slight damage from an explosion at its plant. The company operates a brass, bronze and aluminum foundry, a brass machine shop, tool room and casting shop.

Brier Manufacturing Company, Providence, R. I., jewelry makers, are preparing plans for the construction of a $70,000 factory. The company operates a tool room, plating, japanning, stamping, tinning, soldering, polishing and lacquering departments.

Botfield Refractories Co., Philadelphia, Pa., manufacturers of Adamant fire brick cement, announces the appointment of Ires Prosser as Southeastern representative. Mr. Prosser's territory will embrace the entire Southeast from North Carolina to San Antonio, Texas. His headquarters will be at Atlanta, Georgia.

Marlette & Son, Inc., plater, of Buffalo, N. Y., have announced their removal on February 1, 1928, from their Clinton Street office and plant to new and larger quarters at the Thomas Power Building, 1200 Niagara Street. The company specializes in duro-chrome, chromium plating and udylite process cadmium plating.

Durabilt Steel Locker Company, Aurora, Ill., manufacturers of steel lockers and cabinets, has awarded a contract for the construction of a factory addition of one story which will cost, with equipment, approximately $100,000. C. W. Killiam, president of the company, states that no equipment or supplies are to be purchased at this time.

Industrial Metal Company has moved to larger quarters at 2900 East Cumberland Street, Philadelphia, Pa., from their old location at 1373-77 Frankford Avenue. The company is now close to railroad and marine shipping facilities. New furnaces for the reclamation of non-ferrous metals and their by-products have been installed.

Rockford Metal Specialty Company, Rockford, Ill., will start construction of a new and larger manufacturing building this spring. This is necessitated by the company's increasing business. The Rockford company manufactures stamped metal products, particularly for the automobile industry, operating a tool room, plating, japanning and lacquering, stamping and polishing departments.

Wilson Welder and Metals Company, Inc., Hoboken, N. J., has appointed the following representatives for its line of welding machines: Joseph T. Ryerson & Son, Inc., with offices at Chicago, Jersey City, Buffalo, Pittsburgh, Cleveland, Detroit, Cincinnati, St. Louis and Houston; Oliver H. Van Horn Company, New Orleans; Smith, Booth, Usher Company, Los Angeles and San Francisco; Austin-Hastings Company, Inc., Boston.

Thomas Savill's Sons, 1310 Wallace Street, Philadelphia, Pa., manufacturers of plumbing equipment and supplies, will remodel for a new plant the two and four-story factory at North Hancock and Huntingdon Streets, formerly held by Fred C. Wolsteinholme, textile products. The company operates the following departments: brass foundry, brass machine shop, casting shop, plating, polishing and grinding. Chromium plating work is sent out to be done.

Wisconsin Ornamental Iron and Bronze Company has been adopted as the new firm style of the firm heretofore known as the Wisconsin Iron and Wire Works, 1660 Booth Street, Milwaukee, Wis. The company operates the following departments: brass, bronze and aluminum foundry, brass machine shop, tool room, casting shop, brazing, plating, polishing, lacquering and grinding rooms.

The Max Schaffer Company, Inc., 361 Stagg St., Brooklyn, N. Y., importers and manufacturers of decorative lighting glassware, and the Lion Electric Manufacturing Company, 31 West 15th Street, New York, metal lighting fixture makers, have consolidated and will operate under the name of The Max Schaffer Company, Inc., with headquarters at the Brooklyn address, where the new plant of the Lion concern is situated. The Lion company's studio at 31 West 15th Street, New York, will be maintained as a sales and show room.

The Meuhlhausen Spring Company, 5841 South Loomis Boulevard, Chicago, Ill., has completed the erection of a new building at Logansport, Ind., at a cost of about $90,000, and will remove to the new location where increased facilities have been provided for the manufacture of steel, brass, bronze and other metal springs. The company operates plating, japanning, stamping and grinding departments as well as a tool room.

The plant of the **General Bronze Company,** on Penn Avenue, Pittsburgh, Pa., sustained between $40,000 and $50,000 damage on December 31, 1927, when fire spread to its from the adjoining building occupied jointly by the **H. P. Gazzam Machine Company** and the **Stewart-Thomas Foundry Company.** The loss to all companies totaled about $75,000. The General Bronze Company is continuing its business as usual, having immediately erected temporary buildings, to stand until a new building, equipped fully with modern machinery, is erected. The company's loss was entirely covered by insurance. It operates a brass, bronze and aluminum foundry as well as a brass machine shop.

The **Burndy Engineering Company,** 10 E. 43rd Street, New York, has been appointed as distributors of Everdur by the American Brass Company. This material is a new alloy of copper, silicon, and manganese, which has unusual properties of strength and corrosion resistance. When rolled, the bar has a tensile strength approaching 100,000 pounds per square inch, and a fatigue of 200,000,000 cycles at a tension of 25,000 pounds per square inch, plus and minus. The Burndy company is preparing to stock Everdur not only in all basic forms, such as ingot, tube, sheet, bar, but is also in a position to supply castings of this material. A stock of bolts, nuts, and rivets is maintained in New York.

Review of the Wrought Metal Business

Written for The Metal Industry by J. J. WHITEHEAD, President of the Whitehead Metal Products Company of New York, Inc.

Conditions in the brass and copper industry are about the same as those reported for December. Manufacturers of brass and copper rods, sheets, tubes and wire went over the end of the year with a large number of contracts on hand, but specifications have been rather slow in coming in during January, as business has continued to be somewhat slack in most quarters.

The automobile and building trades continue to show activity. Other trades, however, are slowly showing only a small degree of improvement.

In consequence of this condition the demand for brass and copper mill products has been somewhat restricted in the opening month of the year. But this is not regarded as an indication of what may be expected as the Spring months approach.

An interesting item showing the expanding use of copper and brass materials is found in the fact that one of the largest of the home builders in the East has definitely committed himself to the purchase of 500 copper storage tanks for hot water supply in the homes which he is building. Up to this time all of these houses had been equipped with galvanized iron hot water boilers.

It so happens that specifications against contracts and new business for nickel and the nickel and copper alloys, such as Monel metal, nickel silver, and other similar metals, have been coming in very rapidly during the month of January, with the result that fabricators of these metals have the largest order books which they have had for a long time past.

At the Motor Boat Show held in New York in January a number of the manufacturers of high-powered racing motor boats exhibited their products equipped with Monel metal shafts. One large manufacturer of rayon in this country has installed a device for purifying water for use in the manufacture of his products. This device is made of pure nickel sheets and tubes, and represents a tonnage of about 25,000 lbs. This is the first application of nickel to this line of work, and the results are expected to justify the expenditure because of the improvement to the product by keeping the water uncontaminated. The Lincoln Motor Car Company has heretofore been making their instrument boards of stainless steel. They have recently, however, changed the specifications for the metal for use in these instrument boards and are now using Monel metal for this purpose.

There is a feeling of conservative optimism prevailing throughout the entire trade, with the expectation that the next two or three months will see satisfactory business on the books.

Metal Market Review

Written for The Metal Industry by R. J. HOUSTON, D. Houston & Company, Metal Brokers, New York

COPPER

A steady market basis was maintained in copper during January. There was a moderate volume of business for domestic account, but foreign buying was on a heavier scale. It was successfully demonstrated that the situation was under excellent control, and that selling pressure on the part of the leading holders was unnecessary during an interim of local dullness. The large amount of export buying was a sustaining influence.

Price changes were comparatively slight in the domestic market, with a range of 14c. to 14⅛c. for electrolytic delivered to Connecticut Valley points. The export price was maintained throughout the month at 14½c., c. i. f. European ports. Market closed firm at 14⅛c. delivered to Connecticut Valley points.

ZINC

A fair degree of activity and a steady market trend continues in zinc. Heavy production of both ore and metal are in evidence and consumers are not over eager to stock up under the circumstances. Present prices are not much above the low point of last year, but they are a little better than they were a few weeks ago, when East St. Louis was quoted at 5.60c. and New York at 5.95c.

The Joplin ore price at month-end was up to $37 per ton, an advance of $1 per ton over the week previous, and Prime Western slab zinc was quotable at 5.67½c. to 5.70c. at East St. Louis. There was moderate buying and a little firmer tendency.

TIN

Developments in the tin market last month were especially depressing to values owing to much selling pressure and frequent displays of weakness at London and New York. There seemed to be a lack of confidence among both consumers and dealers. Despite this attitude on the part of buyers, there were market rallies from time to time when bearish tactics were withdrawn.

Prompt and future deliveries of Straits sold at 54⅛c. and 54¼c. around the middle of the month. These prices were the lowest since 1925, when the market touched 50c. in April of that year. London and Singapore were free sellers at the decline. Early in January, Straits tin for prompt delivery was quoted at 57⅝c. to 57¾c. on what was regarded as apparently favorable statistics. The high prices did not last long. Consumers bought on the different market dips, but conditions were too unsettled to facilitate steady purchases. London authorities estimate output of tin by the chief producers of the world, exclusive of China, in 1927 at 139,901 tons, as against 125,106 tons in 1926, an increase of 14,795 tons. Market at end of January was 54⅜c. to 54¾c. for February, March and April deliveries. These quotations are 10 cents a pound below the price of Straits tin one year ago.

LEAD

A continuation of moderate buying and a remarkably steady domestic market have been the outstanding features in the lead situation. There is a large potential demand both at home and abroad. Any quickening of the buying movement due to a pronounced increase in the volume of requirements might be sufficient not only to stiffen prices but to give them a push upward. There has been no change in the New York level of 6½c. for many weeks. A slight variation was noted for East St. Louis delivery, with some resale contracts going at 6¼c., but a real wave of activity would soon change the tendency in the Middle West. Consumers showed interest but followed a conservative course in placing orders; such an attitude is always capable of reversal when conditions suggest a different move. Many imperative requirements will have to be covered in the next few weeks, and a large turnover is expected for February and March. World production of lead in 1927 is reported at 1,828,800 tons, as against 1,761,500 tons in 1926, an increase of 67,300 tons. United States production, however, was 687,273 tons in 1927, as compared with 708,147 tons in 1926, being a decrease of 20,874 tons. World consumption of lead in 1927 was apparently greater than in 1926, although American consumption appeared to fall off from 7 to 8 per cent from previous figures. Demand from other parts of the world showed an estimated increase of some 14 to 15 per cent, due to improved industrial conditions abroad.

ALUMINUM

Stability has characterized the market for aluminum. In January the situation was maintained on the basis of 24.30c. for 99 per cent plus and at 22.30c. for metallurgical 94 per cent plus ingots. Recent buying was on a substantial scale, with important tonnages taken for nearby and distant months. Leading producers express great confidence in the bright outlook for 1928, and it is estimated that automobile manufacture alone will require 20,000,000 pounds more this year than in 1927. Expanding use of this metal appears to be a foregone conclusion by trade experts. Specifications for requirements have developed in an en-

couraging way among regular manufacturers, and new outlets are also being created involving considerable supplies. World production of aluminum in 1927 has been estimated at approximately 450,000,000 pounds. The aircraft industry and transportation are opening up new fields for aluminum and its alloys, but on the other hand there are those who entertain the idea that production may be speeded up too fast for consumption to keep up with output. But modern improvements are developing so rapidly that consumption could easily exceed the present output.

ANTIMONY

There was a firmer tone to the market for antimony during the final days of January. Interest centered around the spot position especially, at which the market was quoting 11⅛c. to 11¼c. duty paid. Buying has been restricted largely to actual nearby requirements, and forward deliveries were more or less neglected. Chinese offerings reflected a stronger feeling in the Far East, but the response from consumers was not pronounced. Imports of antimony into this country for the first eleven months of 1927 amounted to 23,238,306 pounds, as against 27,371,254 pounds for the corresponding months of 1926, a decrease of 4,132,948 pounds. Stocks of antimony in bonded warehouses at the end of November were 3,570,579 pounds, compared with 1,924,684 pounds on January 1, 1927. Lately the differential usually existing between spot and futures has been obliterated and all positions are practically at the same price of 11¼c. per pound. One year ago the price was at 14⅛c. for Chinese regulars, 99 per cent pure.

QUICKSILVER

The general tone of the quicksilver market is easy at $123 to $124 per flask of 76 pounds; there were indications that a little under those figures would be accepted. A fair inquiry was reported, but consumers were inclined to be rather cautious.

PLATINUM

A more active demand and higher prices have been features in platinum lately. Buyers increased their purchases as conditions for this metal began to improve. Since the first of the year prices have advanced from around $66 to $85 per ounce for refined platinum. During 1927 prices declined from $115 to $65 an ounce. The average price last year was $78.49, as against $109.48 in 1926.

SILVER

The general tone of the market for silver is easier than it was a month ago. China was a buyer off and on throughout recent weeks, but India displayed little interest. On the whole, the Far East requirements have not been urgent enough to stimulate the market. There was a fairly steady tone at intervals, but the movement on orders is too tardy to impart pronounced strength to the situation. Silver production in the United States in 1927 amounted to 58,645,622 ounces, valued at $33,252,635. Output last year fell off 4,972,124 ounces, as compared with production in 1926. In 1915, the year of greatest domestic production, silver output totaled 74,961,075 ounces. The New York price at close of month was 56¾ cents per ounce.

OLD METALS

Export interest in heavy copper and wire has afforded sellers a good outlet for these grades of scrap material. Europe has proved an excellent customer for liberal shipments of old copper, and will undoubtedly have important requirements right through the current year. Old scrap copper and copper alloys in Great Britain and parts of Europe have been reduced almost to the vanishing point. The war reserves have found their way back into the melting pot. That fact will probably mean a more pronounced demand on this country for supplies of both old and new copper. Domestic consumers have been buyers from time to time on a restricted scale. Dealers quote the following prices as a buying basis: Heavy copper and wire, 11½c. to 11¾c.; light copper, 10c. to 10¼c.; heavy brass, 7¼c. to 7½c.; light brass, 5¾c. to 6c.; old zinc, 3½c. to 3¾c.; heavy lead, 5¼c. to 5½c.; aluminum clippings, 17½c. to 18c.

Daily Metal Prices for the Month of January, 1928

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	2*	3	4	5	6	9	10	11	12	13	16	17	18
Copper c/lb. Duty Free													
Lake (Delivered)	...	14.25	14.25	14.25	14.25	14.25	14.25	14.25	14.25	14.25	14.25	14.25	14.25
Electrolytic (f. a. s. N. Y.)	...	14.30	14.35	14.40	14.40	14.40	14.35	14.30	14.30	14.30	14.35	14.35	14.35
Casting (f. o. b. N. Y.)	...	13.80	13.80	13.90	13.90	13.90	13.90	13.75	13.75	13.75	13.75	13.75	13.75
Zinc (f. o. b. St. L.) c/lb. Duty 1¾c/lb.													
Prime Western	...	5.65	5.65	5.65	5.65	5.675	5.65	5.65	5.65	5.625	5.625	5.625	5.625
Brass Special	...	5.70	5.70	5.70	5.70	5.75	5.70	5.70	5.70	5.675	5.675	5.675	5.675
Tin (f. o. b. N. Y.) c/lb. Duty Free													
Straits	...	57.75	57.375	56.625	56.50	56.875	56.125	56.375	55.75	55.25	54.875	54.25	54.625
Pig 99%	...	57.375	56.75	56.125	56.00	56.125	55.50	55.625	55.375	54.625	54.375	53.625	54.00
Lead (f. o. b. St. L.) c/lb. Duty 2⅛c/lb.	...	6.35	6.325	6.325	6.325	6.325	6.30	6 30	6.30	6.30	6.30	6.30	6.275
Aluminum c/lb. Duty 5c/lb.	...	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30
Nickel c/lb. Duty 3c/lb.													
Ingot	...	35	35	35	35	35	35	35	35	35	35	35	35
Shot	...	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	...	37	37	37	37	37	37	37	37	37	37	37	37
Antimony (J & Ch) c/lb. Duty 2c/lb.	...	10.875	10.875	10.875	10.875	10.875	11.00	11.	11.	10.875	10.875	10.875	10.875
Silver c/oz. Troy Duty Free	...	57.625	57.50	57.875	57.75	57.625	57.625	57.625	57.625	57.375	57.25	56.875	56.875
Platinum $/oz. Troy Duty Free	...	70	70	71	74	74	74	74	74	75	85	85	85

	19	20	23	24	25	26	27	30	31	High	Low	Aver.
Copper c/lb. Duty Free												
Lake (Delivered)	14.25	14.25	14.25	14.24	14.25	14.25	14.25	14.25	14.25	14.25	14.25	14.25
Electrolytic (f. a. s. N. Y.)	14.35	14.35	14.35	14.35	14.35	14.35	14.35	14.35	14.35	14.40	14.30	14.348
Casting (f. o. b. N. Y.)	13.75	13.75	13.75	13.75	13.75	13.75	13.75	13.75	13.75	13.90	13.75	13.783
Zinc (f. o. b. St. L.) c/lb. Duty 1¾c/lb.												
Prime Western	5.625	5.60	5.65	5.65	5.675	5.675	5.675	5.70	5.675	5.70	5.60	5.65
Brass Special	5.675	5.675	5.70	5.70	5.725	5.725	5.725	5.75	5.725	5.75	5.675	5.702
Tin (f. o. b. N. Y.) c/lb. Duty Free												
Straits	54.625	55.	55.75	55.375	55.375	54.875	55.50	54.875	54.625	57.75	54.25	55.637
Pig 99%	54.25	54.625	55.375	55.	55.	54.50	55.	54.50	53.75	57.375	53.625	55.119
Lead (f. o. b. St. L.) c/lb. Duty 2⅛ c/lb.	6.275	6.275	6.275	6.275	6.275	6.275	6.275	6.275	6.25	6.35	6.25	6.294
Aluminum c/lb. Duty 5c/ lb.	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30
Nickel c/lb. Duty 3c/lb.												
Ingot	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	37	37	37	37	37	37	37	37	37	37	37	37
Antimony (J & Ch) c/lb. Duty 2c/lb.	10.875	10.875	10.875	11.	11.	11.125	11.25	11.25	11.25	11.25	10.875	10.970
Silver c/oz. Troy Duty Free	56.50	56.75	56.625	56.50	56.625	56.50	56.75	57.125	56.75	57.875	56.50	57.131
Platinum $/oz. Troy Duty Free	85	85	85	85	85	85	85	85	83	85	70	79.714

*Holiday.

Metal Prices, February 6, 1928

NEW METALS

Copper: Lake, 14.25. Electrolytic, 14.00. Casting, 13.75.
Zinc: Prime Western, 5.65. Brass Special, 5.70.
Tin: Straits, 53.625. Pig, 99%, 52.875.
Lead: 6.25. **Aluminum,** 24.30. **Antimony,** 11.00.

Nickel: Ingot, 35. Shot, 36. Elec. 37. Pellets, 40.
Quicksilver: flask, 75 lbs. $123. **Bismuth,** $2.20-$2.30.
Cadmium, 75. **Cobalt,** 97%, $2.60. **Silver,** oz., Troy, 56.50.
Gold: oz., Troy, $20.67. **Platinum,** oz., Troy, $85.

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	10 to11
Brass Ingots, Red	12½to13½
Bronze Ingots	12½to16
Casting Aluminum Alloys	21 to24
Manganese Bronze Castings	23 to40
Manganese Bronze Ingots	12½to16½
Manganese Bronze Forging	32 to40
Manganese Copper, 30%	25 to35
Monel Metal Shot	28
Monel Metal Blocks	28
Parsons Manganese Bronze Ingots	18¾to19¾
Phosphor Bronze	14 to15
Phosphor Copper, guaranteed 15%	18 to21
Phosphor Copper, guaranteed 10%	17 to20
Phosphor Tin, guaranteed 5%	75 to80
Phosphor Tin, no guarantee	60 to70
Silicon Copper, 10%....according to quantity	28 to32

OLD METALS

Buying Prices		Selling Prices
12¼to12¾	Heavy Cut Copper	13¾to14
12 to12½	Copper Wire	13 to13¼
10 to10½	Light Copper	11¾to12¼
10 to10¼	Heavy Machine Composition	11 to11½
8 to 8¼	Heavy Brass	9¼to 9½
6¾to 7	Light Brass	8 to 8¼
7¾to 8	No. 1 Yellow Brass Turnings	9¼to 9¾
9¼to 9½	No. 1 Composition Turnings	10¾to11
5¾to 6	Heavy Lead	6¾to 7
3¾to 4	Zinc Scrap	4¾to 5¼
9½to10½	Scrap Aluminum Turnings	12½to14½
14 to14½	Scrap Aluminum, cast alloyed	17½to18½
19½to20	Scrap Aluminum, sheet (new)	22 to22½
37½to39½	No. 1 Pewter	41½to43½
11½	Old Nickel Anodes	13½
17½	Old Nickel	19½

Wrought Metals and Alloys

COPPER SHEET

Mill shipment (hot rolled)	22¾c. to 23¾c. net base
From Stock	23¾c. to 24¾c. net base

BARE COPPER WIRE

15⅞c. to 16⅛c., net base, in carload lots.

COPPER SEAMLESS TUBING

24½c. to 25½c. net base.

SOLDERING COPPERS

300 lbs. and over in one order	21¼c. net base
100 lbs. to 200 lbs. in one order	21¾c. net base

ZINC SHEET

Duty sheet, 15%	Cents per lb.
Carload lots, standard sizes and gauges, at mill, less 8 per cent discount	10.00 net base
Casks, jobbers' price	10.50 net base
Open Casks, jobbers' price	10.75 to 11.25 net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base price	33½c.
Aluminum coals, 24 ga., base price	31½c.

ROLLED NICKEL SHEET AND ROD

Net Base Prices

Cold Drawn Rods	53c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Full Finished Sheet	52c.

BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 10½c. over Pig Tin; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 17c. over; less than 25 lbs., 25c. over.

SILVER SHEET

Rolled sterling silver 57¾c. to 59¾c. per ounce, Troy.

BRASS MATERIAL—MILL SHIPMENTS

In effect December 2, 1927
To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	$0.18¾	$0.20¼	$0.22¼
Wire	.19¼	.20¾	.22¾
Rod	.16½	.21	.23
Brazed tubing	.26¼	.....	.32
Open seam tubing	.26¾	.....	.32
Angles and channels	.29¾	.....	.35

For less than 5,000 lbs. add 1c. per lb. to above prices.

BRASS SEAMLESS TUBING

23⅝c. to 24⅝c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	20¾c. net base
Muntz or Yellow Metal Sheathing (14"x48")	18¾c. net base
Muntz or Yellow Rectangular sheet other Sheathing	19¾c. net base
Muntz or Yellow Metal Rod	16¾c. net base

Above are for 100 lbs. or more in one order

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	26½c.	10% Quality	29½c.
15% "	28 c.	15% "	33¼c.
18% "	29¼c.	18% "	36½c.

MONEL METAL SHEET AND ROD

Hot Rolled Rods (base)	35	Full Finished Sheets (base)	42
Cold Drawn Rods (base)	43	Cold Rolled Sheets (base)	50

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin. price; 100 lbs. to 500 lbs., 10c. over; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 20c over; less than 25 lbs., 25c over. Prices f. o. b. mill.

Supply Prices, February 6, 1928

ANODES

Copper:	Cast	21 c. per lb.
	Rolled	19⅞c. per lb.
	Electrolytic	18¼c. per lb.
Brass:	Cast	20 c. per lb.
	Rolled	19⅞c. per lb.
Zinc:	Cast	12 c. per lb.

Nickel:	90-92%	45c. per lb.
	95-97%	47c. per lb.
	99%	49c. per lb.

Silver: Rolled silver anodes .999 fine are quoted from 59¾c to 61¾c., Troy ounce, depending upon quantity purchased.

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 100 lbs.	100 to 200 lbs.	Over 200 lbs.
10-12-14 & 16"	1" to 3"	$3.00/lb.	$2.75/lb.	$2.65/lb.
6-8 & over 16	1 to 3	3.10	2.85	2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 up to 6	¼ to 3	4.85	4.85	4.85
4 up to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5 45
Under 4	Over 3	5.85	5.85	5.85

Grey Mexican Wheel deduct 10c per lb. from White Spanish prices.

COTTON BUFFS

Full Disc Open buffs, per 100 sections.

12" 20 ply 64/68 Unbleached	$30.10–31.70
14" 20 ply 64/68 Unbleached	40.10–40.80
12" 20 ply 80/92 Unbleached	31.92–32.40
14" 20 ply 80/92 Unbleached	42.20–43.70
12" 20 ply 84/92 Unbleached	36.30–37.15
14" 20 ply 84/92 Unbleached	48.60–50.40
12" 20 ply 80/84 Unbleached	36.30–39.55
14" 20 ply 80/84 Unbleached	48.60–53.60

Sewed Pieced Buffs, per lb., bleached 55–70c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.11-.17
Acid—Boric (Boracic) Crystals	lb.	.12
Chromic, 125 lb. drums	lb.	.24-.25
Hydrochloric (Muriatic) Tech., 20°, Carboys	lb.	.02
Hydrochloric, C. P., 20 deg., carboys	lb.	.06
Hydrofluoric, 30%, bbls	lb.	.08
Nitric, 36 deg., carboys	lb.	.06
Nitric, 42 deg., carboys	lb.	.07
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl	lb	.19-.23½
Denatured, bbls	gal.	.59
Alum—Lump, Barrels	lb.	.03¼
Powdered, Barrels	lb.	.042
Aluminum sulphate, commercial tech	lb.	.02⅜
Aluminum chloride solution in carboys	lb.	.06½
Ammonium—Sulphate, tech., bbls	lb.	.03¾
Sulphocyanide	lb.	.65
Arsenic, white, kegs	lb.	.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Borax Crystals (Sodium Biborate), bbls	lb.	.04½
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.06
Chrome Green, bbls.	lb.	.28
Chromic Sulphate	lb.	.37
Copper—Acetate (Verdigris)	lb.	.37
Carbonate, bbls.	lb.	.16-.17
Cyanide (100 lb. kegs)	lb.	.50
Sulphate, bbls.	lb.	.05¾
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$75.00
Fusel Oil	gal.	$4.45
Gold Chloride	oz.	$14.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.59-.61
Iron Sulphate (Copperas), bbl.	lb.	.01½
Lead Acetate (Sugar of Lead)	lb.	.13¾
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Nickel—Carbonate, dry, bbls.	lb.	.29
Chloride, bbls.	lb.	.17-.18
Salts, single, 300 lb. bbls	lb.	.10½
Salts, double, 425 lb. bbls.	lb.	.10
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash, Caustic Electrolytic 88-92% broken, drums	lb.	.09¾
Potassium Bichromate, casks (crystals)	lb.	.08½
Carbonate, 96-98%	lb.	.07-.07½
Cyanide, 165 lb. cases, 94-96%	lb.	.57½
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.05½
Silver Chloride, dry, 100 oz. lots	oz.	.50½
Cyanide (fluctuating)	oz.	.57½-.59½
Nitrate, 100 ounce lots	oz.	.41¼-.41½
Soda Ash, 58%, bbls.	lb.	.02½
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.19
Hyposulphite, kegs	lb.	.04
Nitrate, tech., bbls.	lb.	.04¾
Phosphate, tech., bbls.	lb.	.03½
Silicate (Water Glass), bbls.	lb.	.02
Sulpho Cyanide	lb.	.45
Sulphur (Brimstone), bbls.	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.41
Tripoli, Powdered	lb.	.03
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc Carbonate, bbls.	lb.	.11-.12
Chloride, casks	lb.	.06¾
Cyanide (100 lb. kegs)	lb.	.41
Sulphate, bbls.	lb.	.03¾